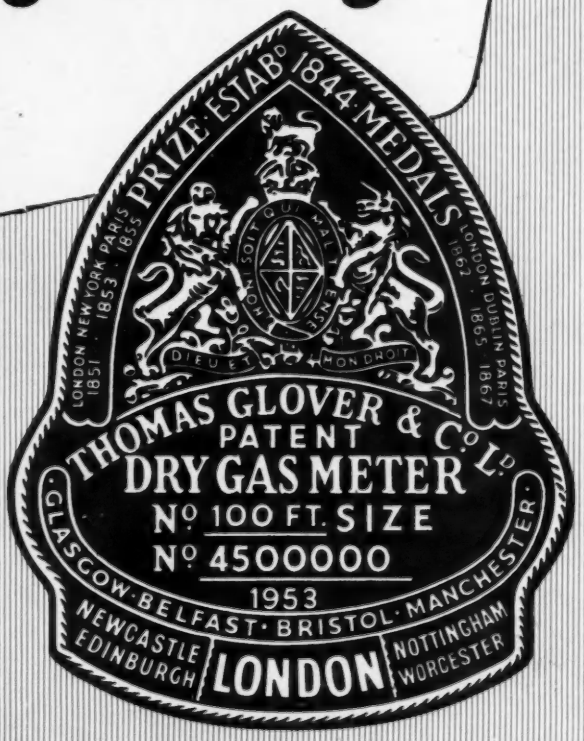
TECHNOLOGY DEPT.

Gas Journal

VOL. 284. 107th YEAR. LONDON, DECEMBER 7, 1955. Nº 4827. PRICE 1/6

The Hall-mark of Quality



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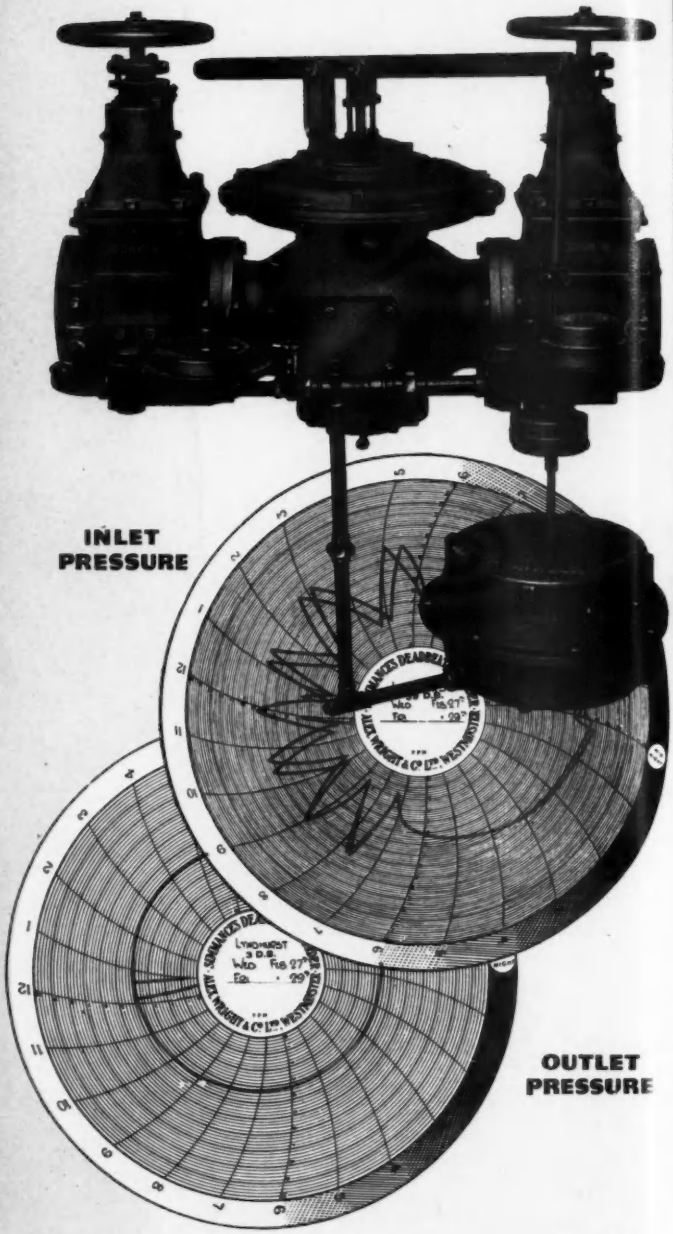
2. ABSOLUTE CERTAINTY OF ACTION UNDER ALL CONDITIONS, WITHOUT ANY WATER SEALS.

3. THE DISTRICT PRESSURE IS ADJUSTABLE AND CAN BE CHANGED WHENEVER DESIRED.

4. THE GOVERNOR CAN BE ARRANGED IN PITS, BUT GENERALLY IS FITTED IN KIOSK ABOVE GROUND.

5. THIS GOVERNOR LENDS ITSELF TO NUMEROUS SPECIAL CONTROLS WHICH CAN READILY BE ADDED, E.G. THE AUTO PILOT GOVERNOR CAN BE USED TO CHANGE PRESSURE FOR VARYING LOADS GIVING A DIFFERENT LINE FOR EVERY DAY OF THE WEEK, OR A DEVICE CAN BE ADDED TO CONSERVE THE INLET PRESSURE AND A PILOT HOLDER VALVE CAN BE ADDED TO SHUT OFF WHEN THE HOLDER REACHES HIGH OR LOW LEVEL. THE GOVERNOR CAN ALSO BE REMOTELY CONTROLLED AND WE SHOULD BE PLEASED TO ADVISE ON ANY SPECIAL CONTROL, FOR ANY CONDITIONS WHICH HAVE TO BE MET.



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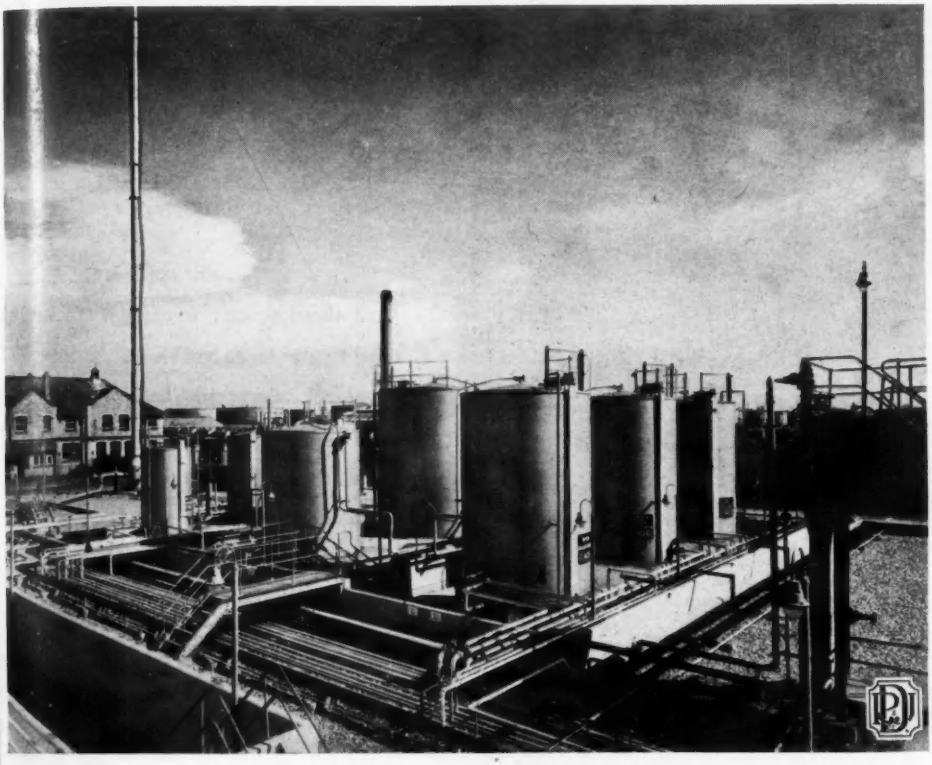

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(Photograph by courtesy of the ASSOCIATED ETHYL COMPANY LTD.).

We make stills and tanks of cast iron or steel; tanks with open or closed tops; with dished, coned, or flat ends; of cylindrical or rectangular form; of bolted, riveted, welded, or pressed construction; with trussed self supporting crowns; and for the storage of liquor, oil, spirit, tar, water, etc.

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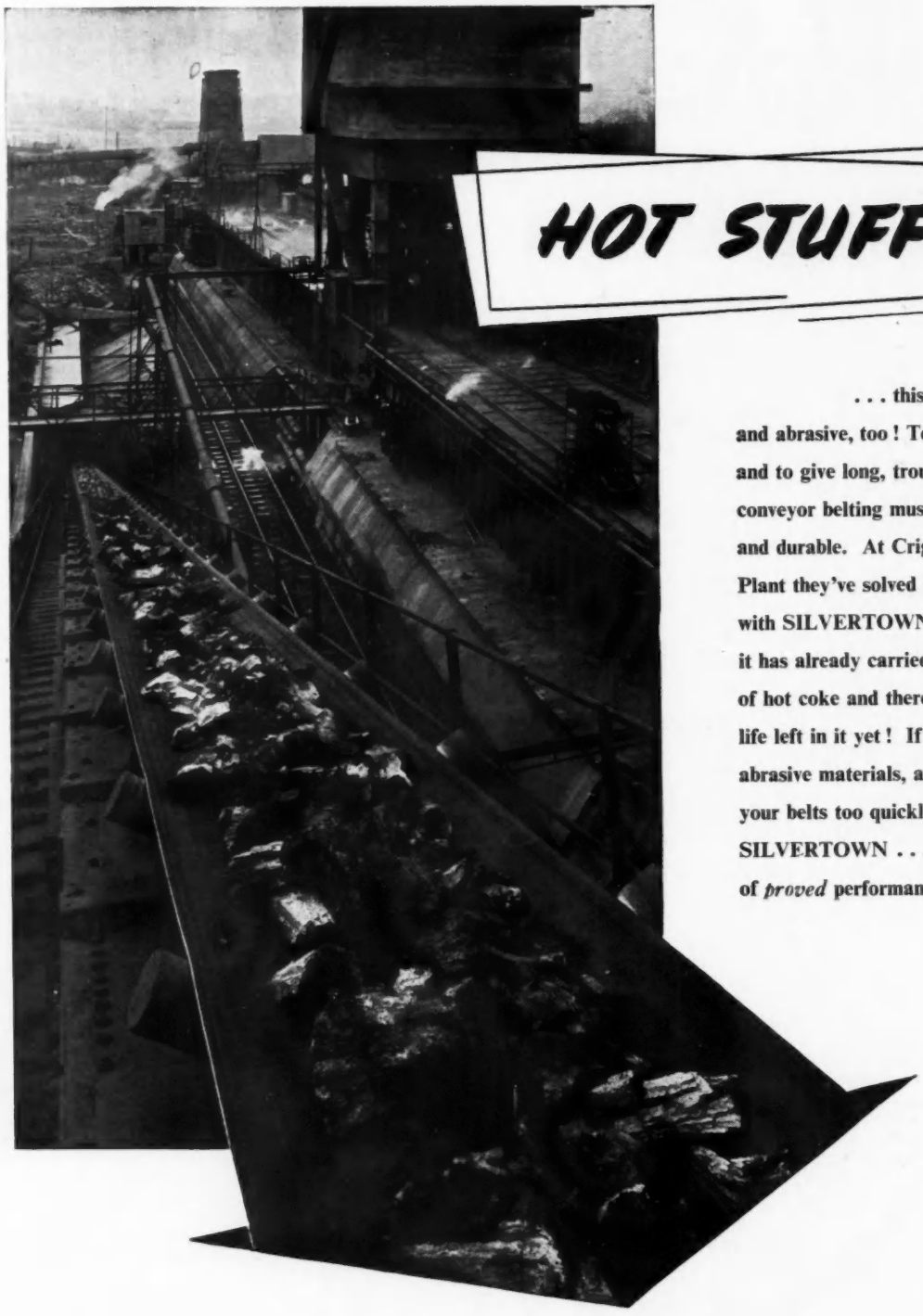

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. . . this coke—
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CONVEYOR BELTING

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FAST COPPER PIPE FABRICATION WITH BRONZE WELDING

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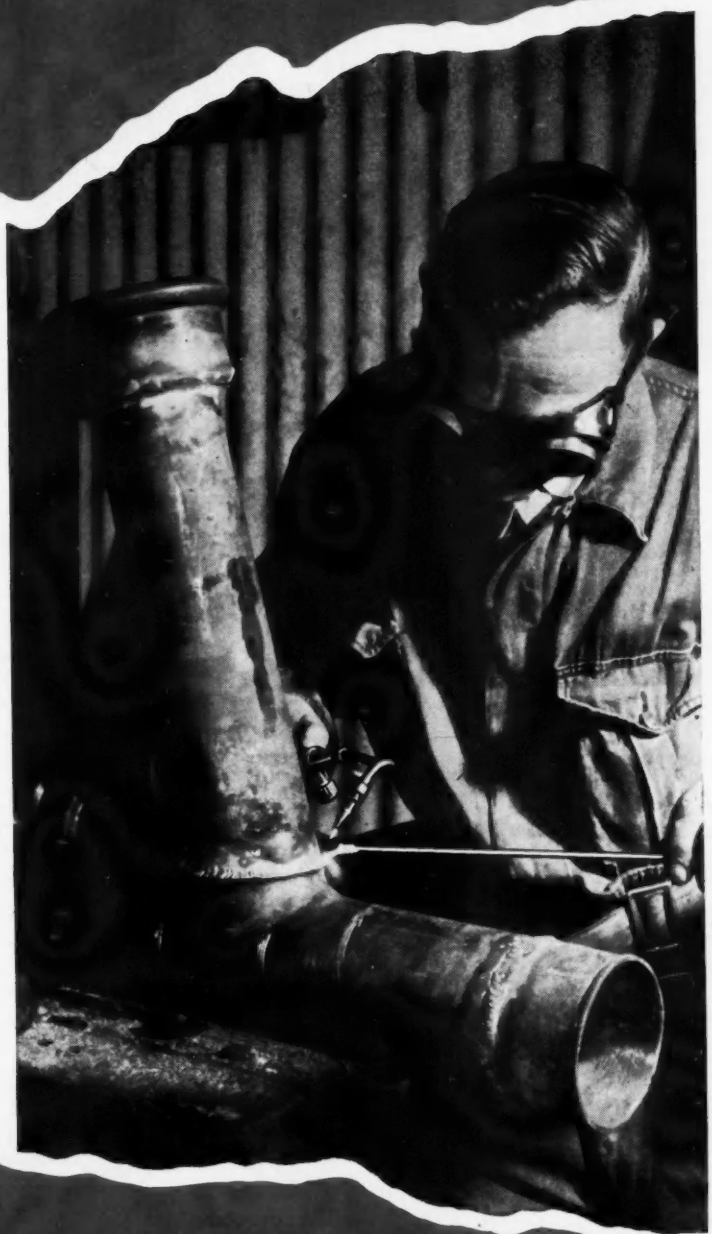

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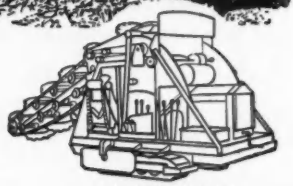
The answer to all your trenching problems

ALLEN *Super Duty* TRENCHERS

For narrow trenches we supply the 12/21 model, and for wide trenches the 16/60 model. Both models are a fine engineering job and capable of standing up to continuous hard work. We shall be pleased to send you further information and fully illustrated brochures on request.



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WHETHER you wish to fix with a Rawlplug device or bore a hole right through a wall to take a pipe or conduit, there's a Rawlplug tool to do the job by hand, electric or air power.

Practical workmen who have used them in all kinds of materials find that the sturdy construction and tough cutting edges of Rawlplug tools stand up to the strain for very long periods, thus making them the most reliable and economical tools to buy.

A new 8" x 10" four-colour 16-page brochure has been produced fully illustrating and describing Rawlplug Tools. This is a very useful publication for any builder, engineer or electrician who has a constant need for the best tools for boring holes in all kinds of material. A copy will be sent free on request. Please ask for Publication No. T.1412.

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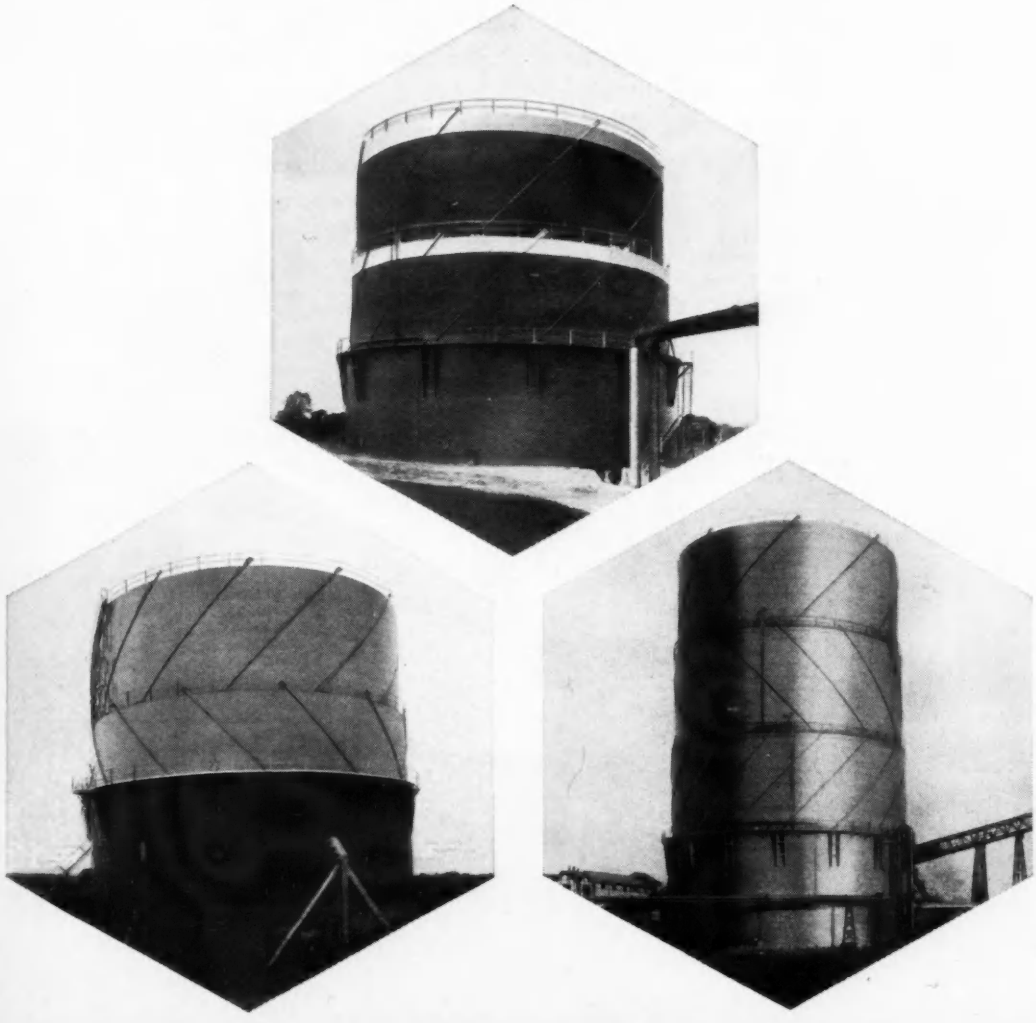

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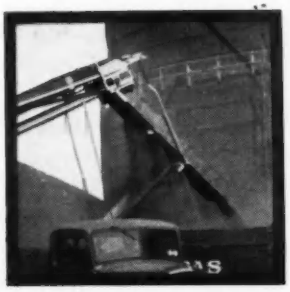

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This continuous, two-in-one operation, recently carried out under test at a gas works, strikingly demonstrates the labour- and cost-cutting efficiency of our 30-ft. Super Mobile Stacker.

The stacker was fitted with our special Screen Attachment and fed by a single mobile shovel. In one hour, it handled 23 tons of old coke stock. The $1\frac{1}{2}''$ clear mesh screen extracted 6 tons of minus-$1\frac{1}{2}''$ coke, leaving 17 tons of well cleaned coke for dispatch to users.

The Super Mobile Stacker can be towed anywhere by a mobile shovel, and it takes only a few minutes to change any screen from $\frac{3}{8}''$ to $1\frac{1}{2}''$. A single operator is all that is required for the complete process.

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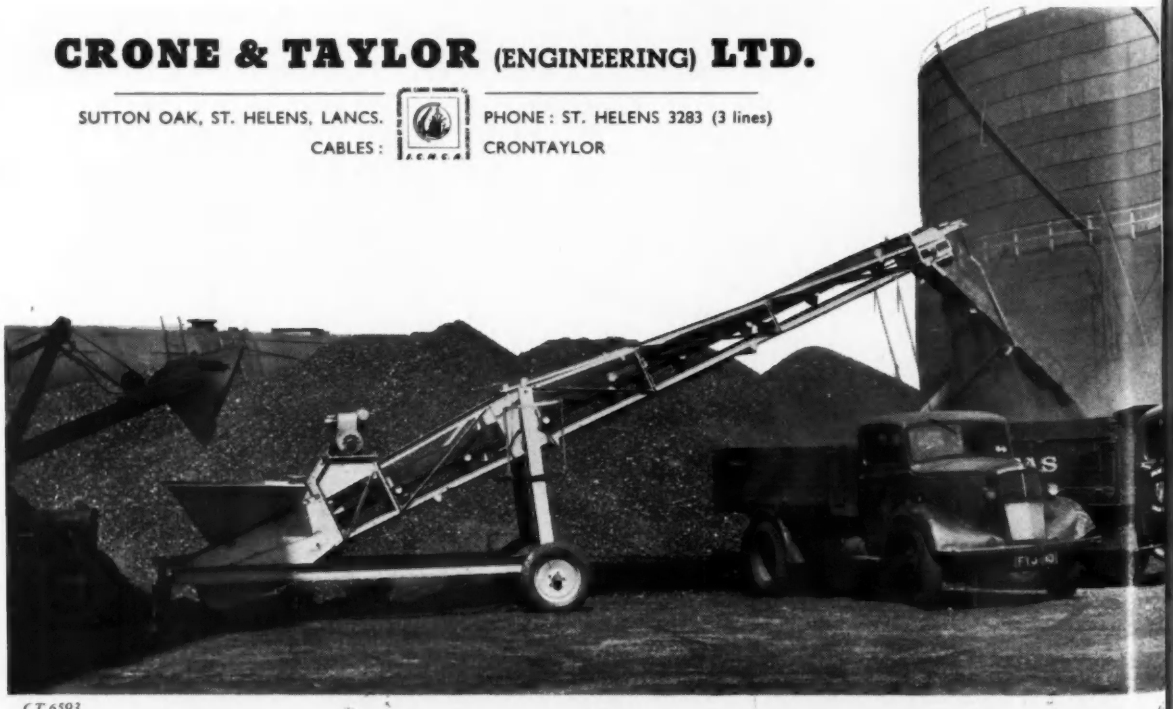
CABLES: CRONTAYLOR

PHONE: ST. HELENS 3283 (3 lines)



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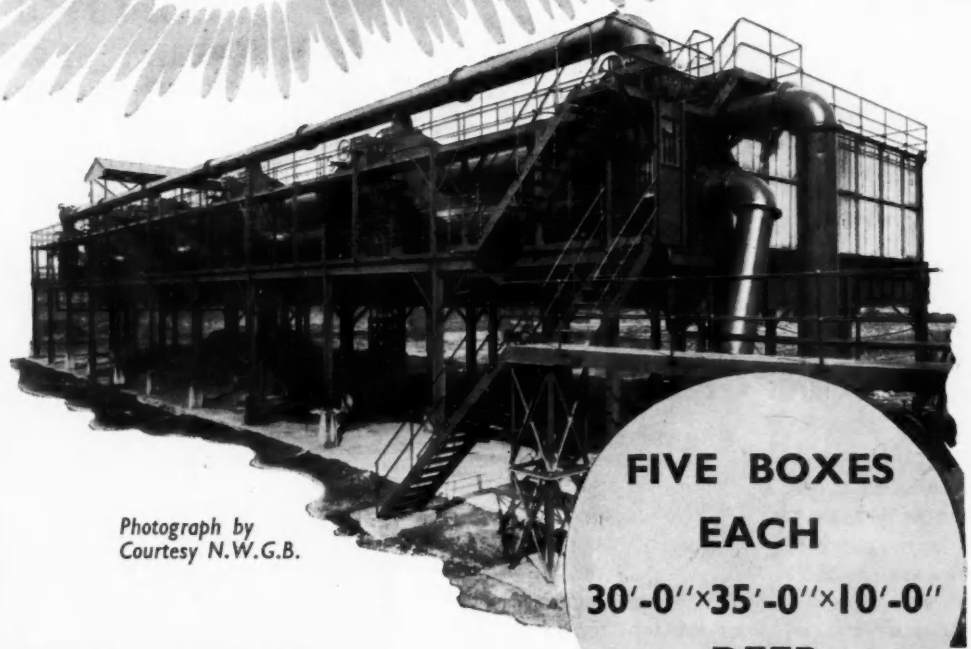
OVERHEAD 4 TIER CAST-IRON PURIFIERS RECENTLY COMPLETED FOR GREAT HARWOOD (ACCRINGTON) GASWORKS



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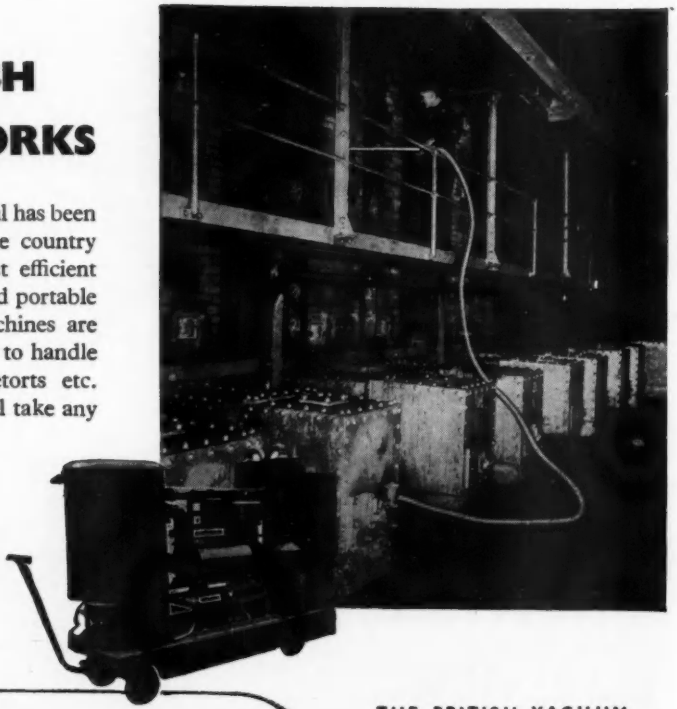
THE B.V.C. system of vacuum dust removal has been established in gas works throughout the country and is now generally recognised as the most efficient system for the purpose; both central plants and portable machines are available. Where portable machines are used a water cooler container allows the plant to handle the hot dust and ash from the top of retorts etc. and specially designed non-choking tools will take any volume of dust.

The illustration shows Redditch Gas works where a portable B.V.C. machine operates through an installed pipe system. Full particulars of these and other installations on request.



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"BRITISH VACUUM CLEANER"
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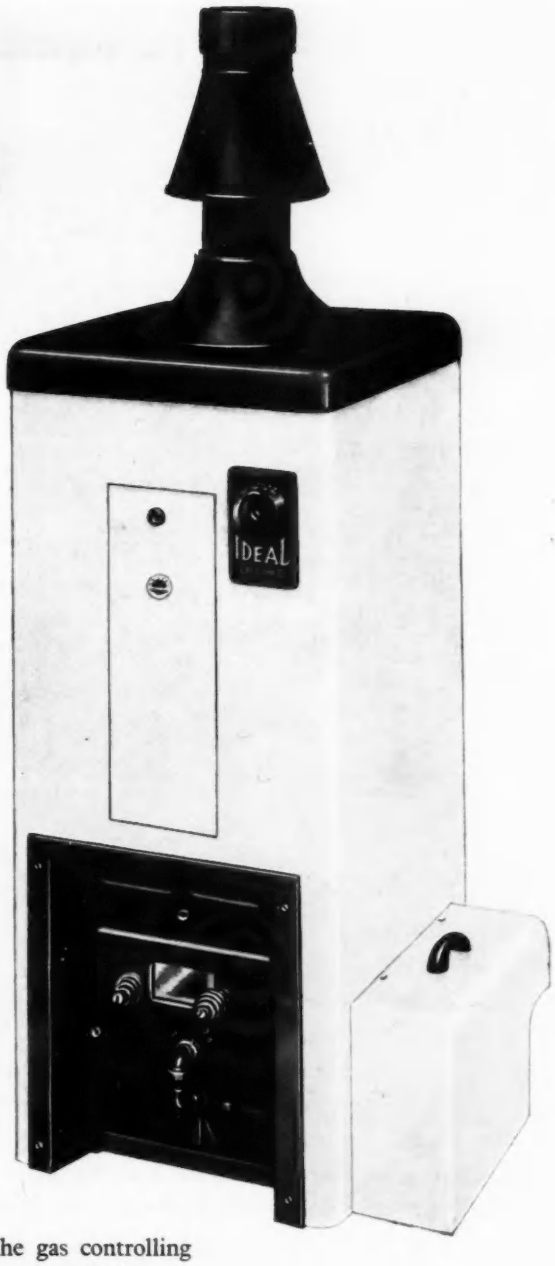

To burn gas efficiently for the production of hot water, either for domestic purposes or central heating, demands a Boiler specially designed for the purpose. Over a period of 20 years we have developed a series of Boilers, each of which is unequalled in its particular field.

All Boilers are equipped with a complete set of thermostatic controls, and have insulated jackets of enamelled steel or aluminium in appropriate finishes. 'Ideal' Gas Boilers, of which several thousands a year are being installed, are available in 22 sizes from 20,000 to 1,430,000 B.T.U. per hour. *An illustrated booklet giving full details is available on request.*

In the current models of the No. 1-GBC series, the gas controlling instruments are protected by a neat removable stove enamelled cover.

IDEAL GAS BOILERS

RELIABLE AND LABOUR-SAVING

IDEAL-Standard

Foremost for heating and sanitary equipment

295 IDEAL BOILERS & RADIATORS LIMITED · IDEAL WORKS · HULL

THE PROGRESS OF GAS

IT WAS NOT UNTIL THE '80S—when the rivalry of electric light made itself felt—that the gas companies turned seriously to the fields of heat and power, domestic and industrial.

Progress, however, was rapid, for much pioneering work had been done in the previous 30 years. Efficient gas heating had quickly followed the appearance of Bunsen's burner in 1855 and, twelve years later, a gas engine had been invented.

To such early experimental achievements as these—and many others such as the General Gordon Gas Bath, which dates from the 1850s—must go much of the credit for the speed with which later appliances made their appearance.

By the last ten years of the century, domestic cookers, fires and water heaters (or 'geysers') were being used on an ever-increasing scale, while furnaces, boilers and other plant using gas for heating were already helping to shape modern industry.

Issued by Imperial Chemical Industries Limited for the interest of the gas Industry—an important user of

I.C.I. copper tubes, capillary and compression fittings

Including: 'KUTERLON' underground copper tubes, 'INTEX P.T.' capillary fittings, 'CONEOR' and 'INSTANTOR' compression fittings.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

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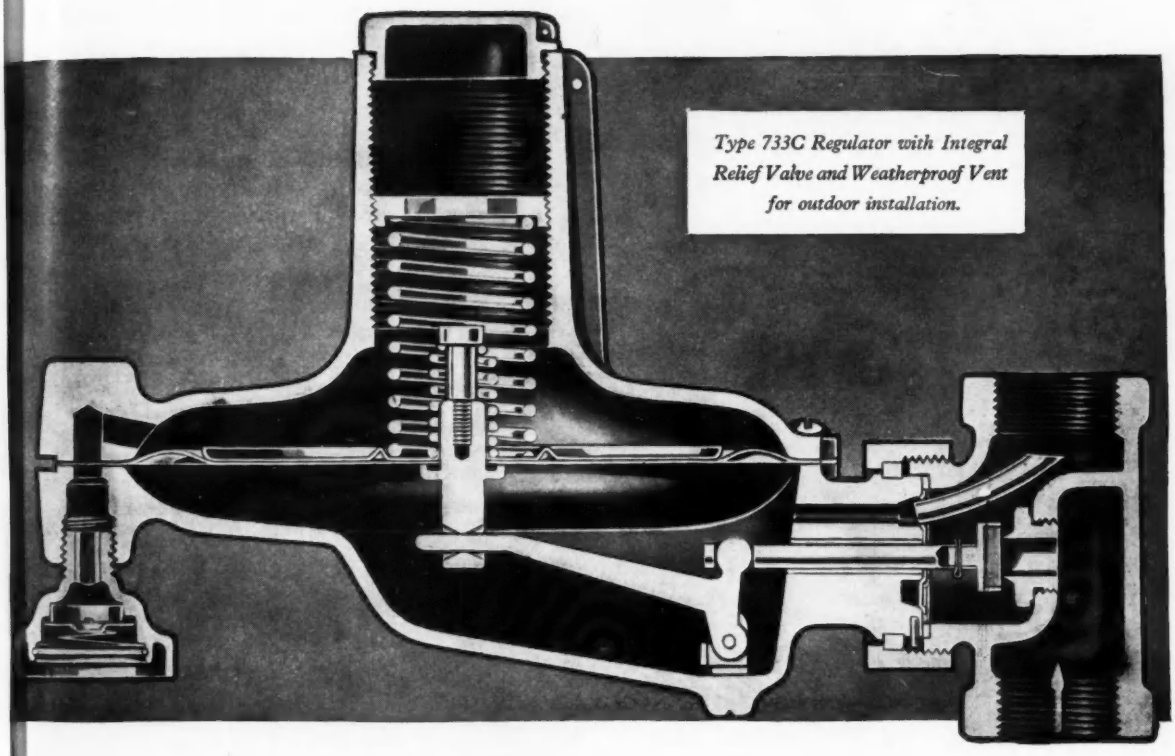
FISHER SERIES 730

Gas Service Regulators



Type 733C Regulator with Integral Relief Valve and Weatherproof Vent for outdoor installation.

Series 730 Regulators, in sizes from $\frac{3}{4}$" to 2", are employed to reduce gas pressures (up to 150 p.s.i.) to inches of water column in the outlet piping. Constant reduced pressure without droop at varying loads is ensured by the pitot tube in the outlet connection. Regulators may be fitted with integral relief valve to relieve excessive pressure build-up.

Catalogue FG20-GB, describing the range of Fisher Pressure Regulators now made in England, is available on request.

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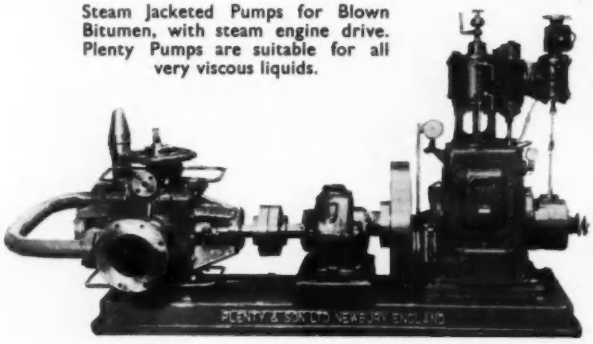
PLENTY Rotary Pumps

Steam Jacketed Pumps for Blown Bitumen, with steam engine drive. Plenty Pumps are suitable for all very viscous liquids.



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Screwed-Gland Flexible Joint : up to 10" dia.
Bolted-Gland Flexible Joint : 12" and above

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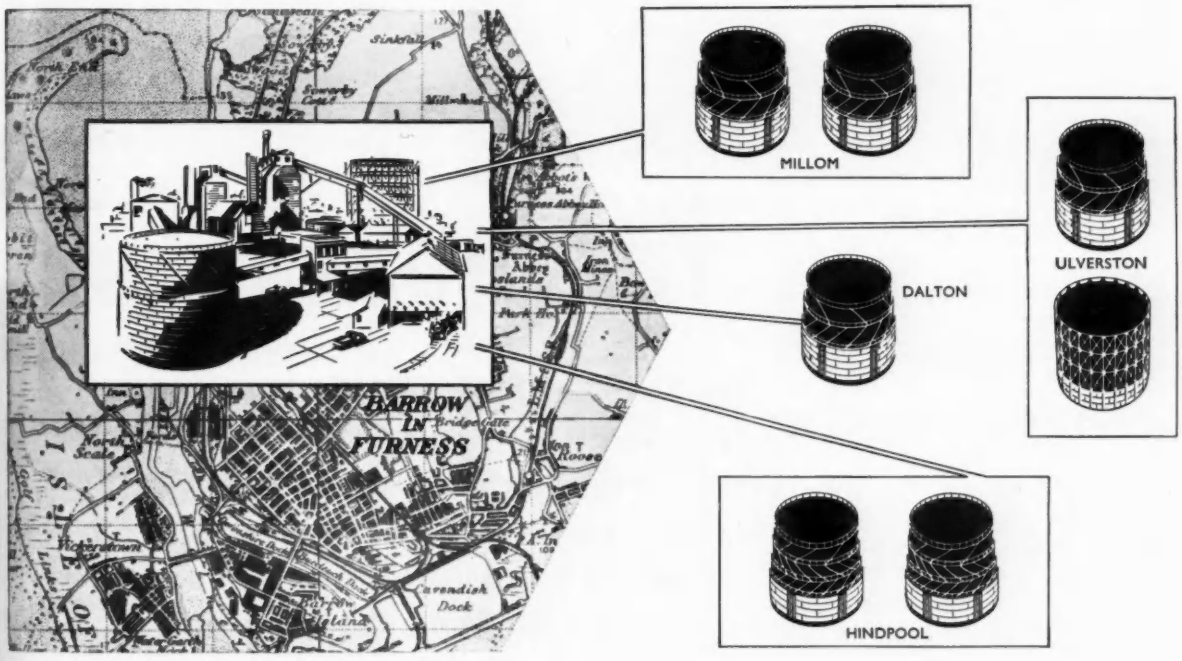
REMOTE CONTROL

solved this problem in gas distribution

The district stations at Ulverston, Dalton, Hindpool and Millom—in the Northern Group of the North-Western Gas Board—are remotely controlled from the Compressor House at Barrow Gas Works. The remote control scheme has been designed jointly by Automatic Telephone & Electric Co. Ltd., who supplied the remote control equipment and the Bryan Donkin Co. Ltd., who supplied the governors, valves, compressors, etc. By means of a single pair of telephone wires to each district station this equipment provides all the following facilities:—

(*a*) Remote indication of pressure at inlet to volumetric governor.
(*b*) Remote indication of flow through volumetric governor into station.
(*c*) Remote control of flow into the station.
(*d*) Remote indication of gasholder stocks, with audible and visible alarms for high and low limits.
(*e*) Remote indication of the district pressure.
(*f*) Remote control (start/stop) and indication (running/stopped) of the station booster.
(*g*) Remote indication and alarm of electricity supply failure.
(*h*) Equipment testing facilities.
(*i*) Telephone communication.



Supervisory Remote Indication and Control Equipment can be applied to interlinked schemes of any size. The equipment employed in the Barrow area has been specially developed for gas distribution control and its use enables the minute-to-minute state of the whole distribution system to be under continuous observation and control. Saving of manpower is considerable because the remote stations can be left unattended for long periods and shift work entirely dispensed with.

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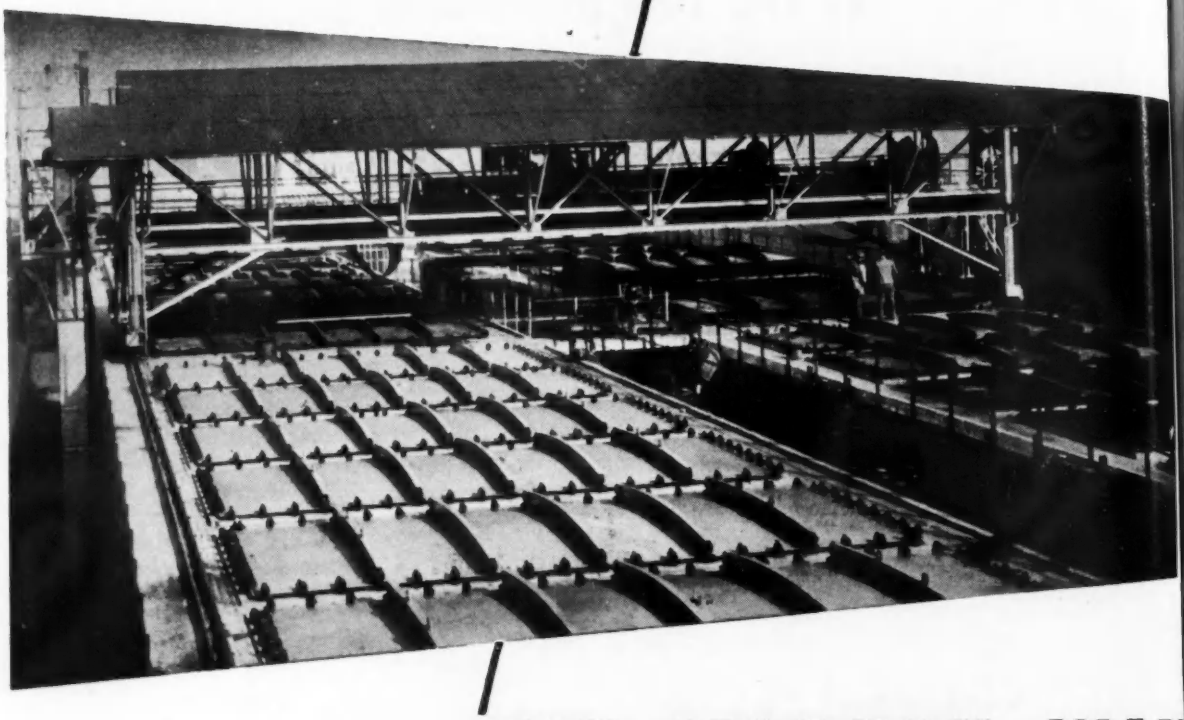

THE MODERN WAY

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ABRASIVE RUBBER COVERED BELT IDLERS

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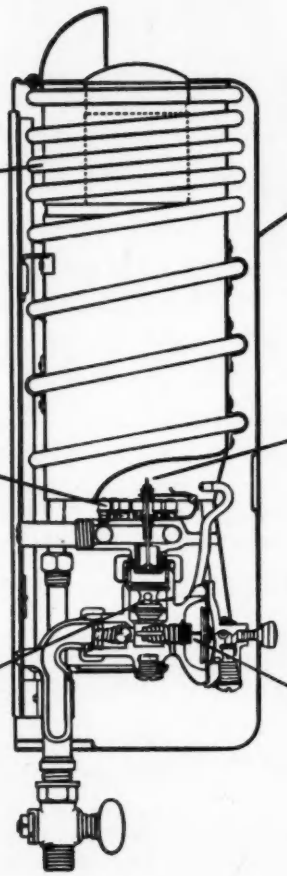
DOUBLE PURPOSE • SINGLE POINT OR MULTIPOINT

Heating coil is in one piece: no joints so no leaks. Single stage heat exchanger has widely spaced fins so that flueways are kept clear and efficiency maintained over long periods.

One-piece square vitreous enamelled case fits flat on wall. Completely encloses body so no deposits can drop out. Whole case lifts off forwards, leaving heater completely accessible and rigid to work on.



Bray type steatite-tipped burners have an exceptionally long service life. They do not corrode and are not susceptible to blockage.

Exceptionally robust construction of pilot safety device spring and spindle (a rod, not wire) resists wear and accidental damage. P S D can be adjusted from the top.

Built-in automatic gas (volume) governor prevents over-gassing and thereby prolongs life of heating unit and reduces maintenance cost.

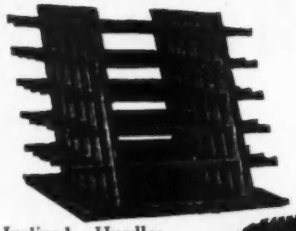
Gas and water sections easily dismantled, the water section being removable by itself.

THEY ADD UP TO *Long Service Life*

Simpler Maintenance

Ewart dependability benefits both consumer and gas industry

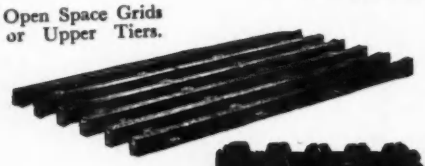
EWART AND SON LTD • WORKS ROAD • LETCHWORTH • HERTS

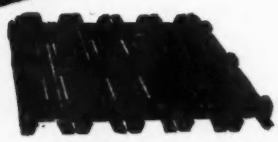


Inclined Hurdles (Light or Heavy Type) with Bottom Flat Grids.

Scrubber Grids.

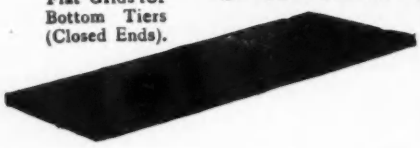
Open Space Grids or Upper Tiers.





Patent Double-Barred Grids.

Flat Grids for Bottom Tiers (Closed Ends).



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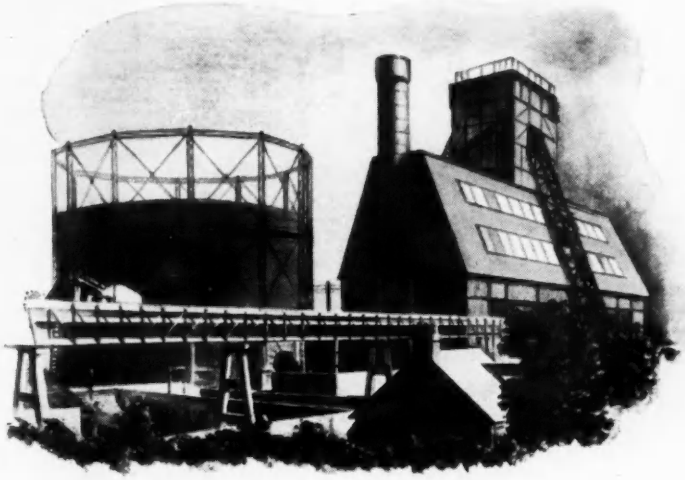

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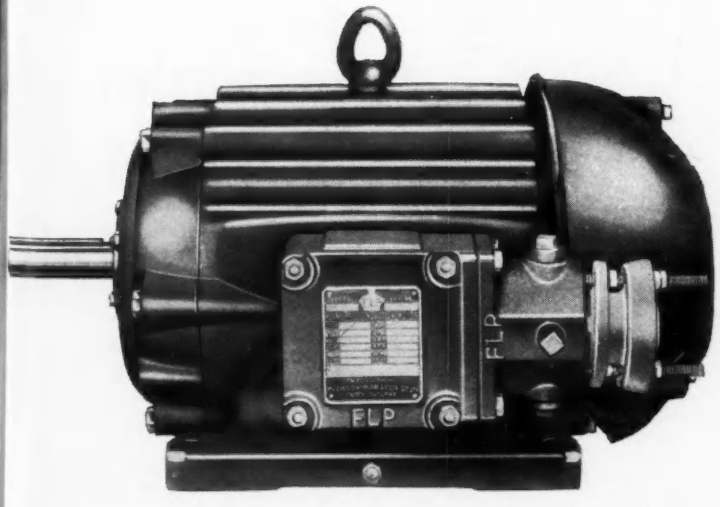

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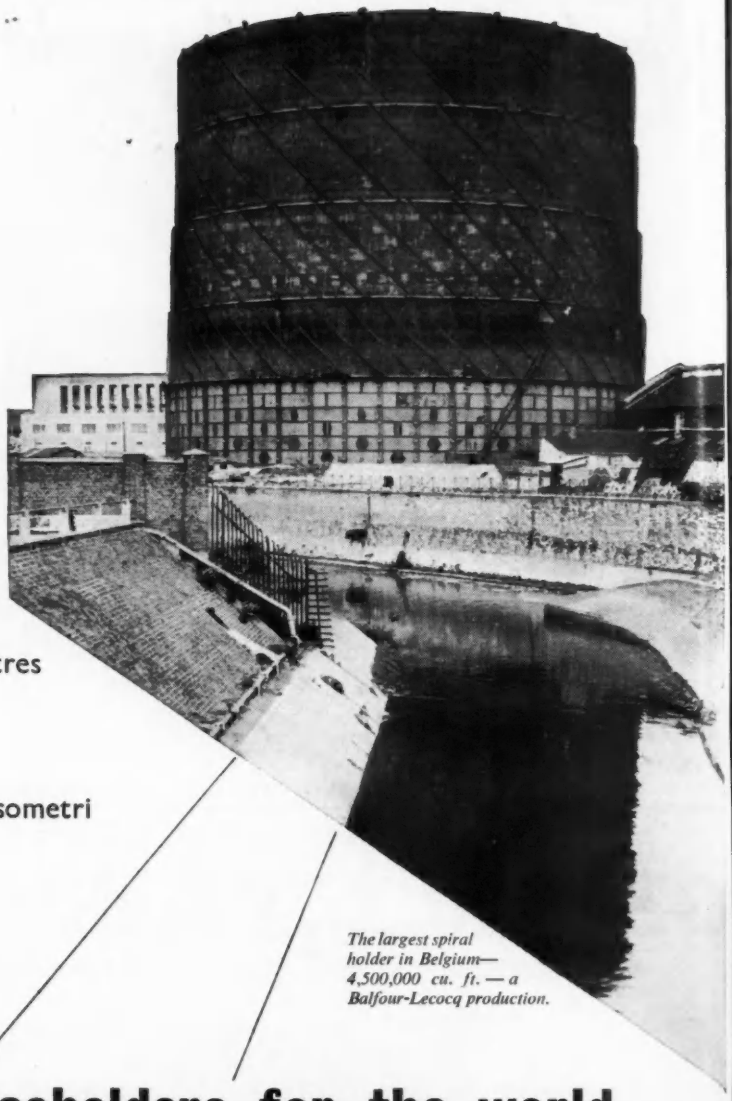

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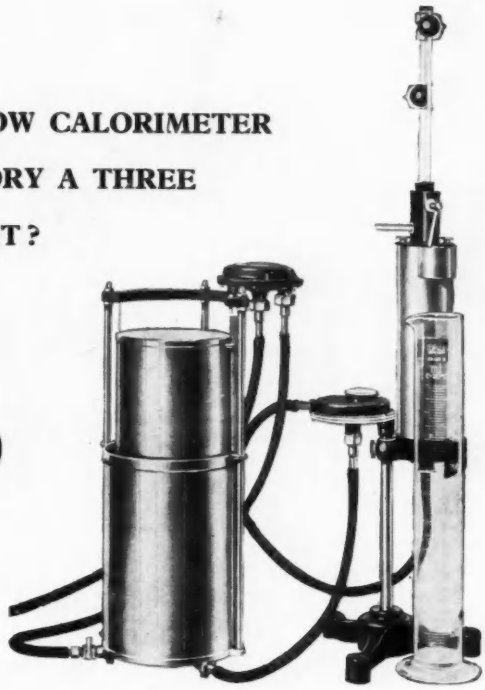

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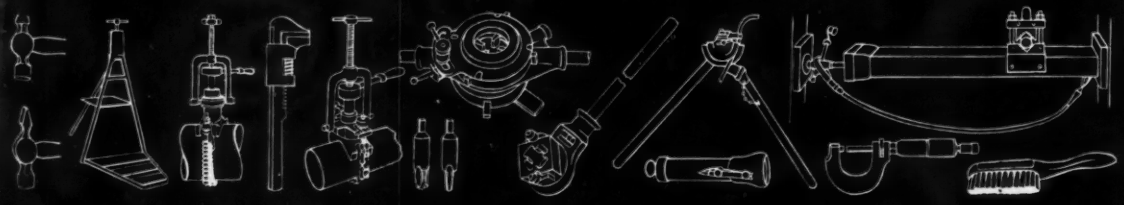

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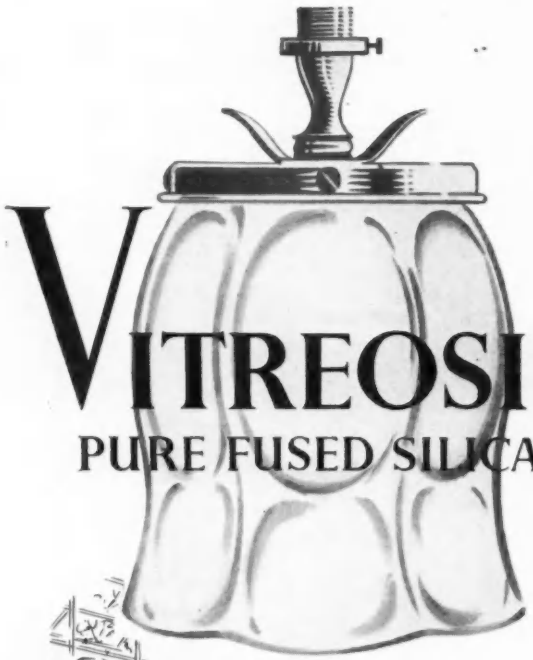

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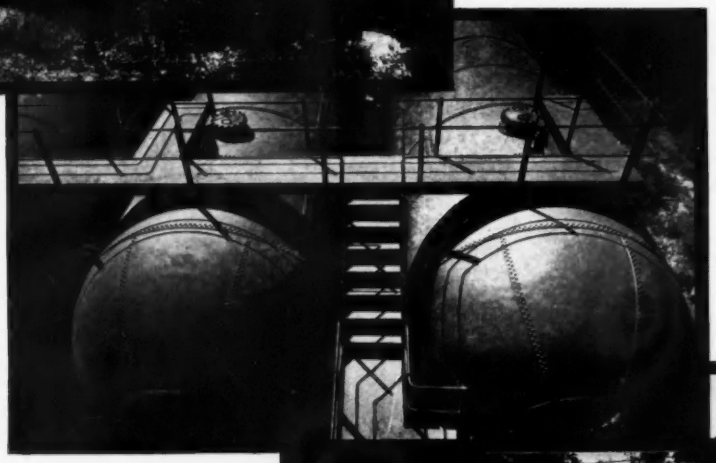

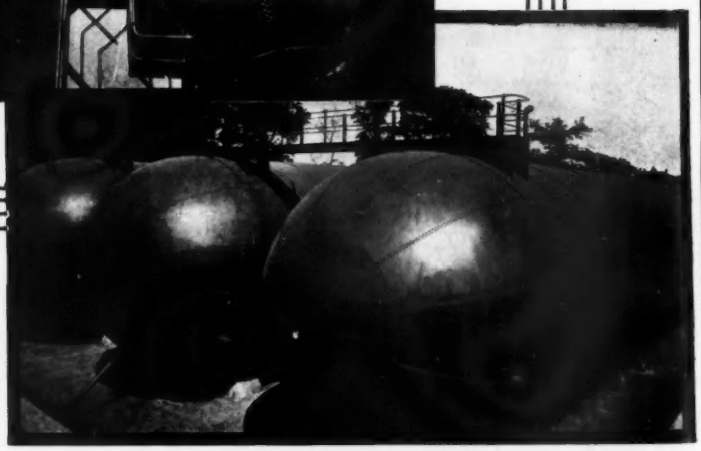

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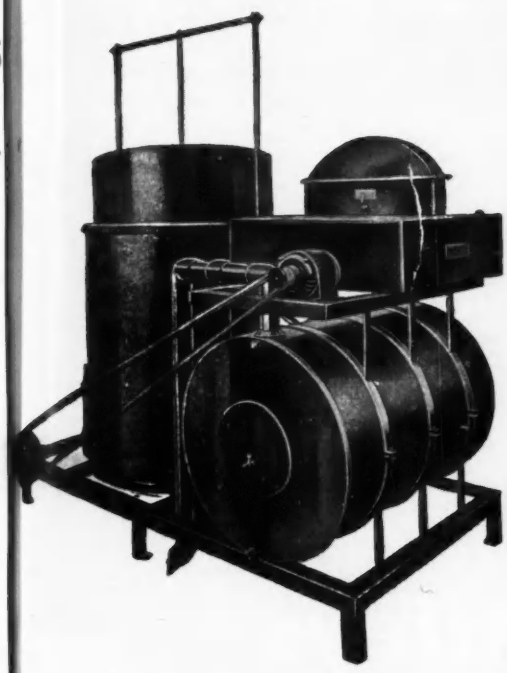

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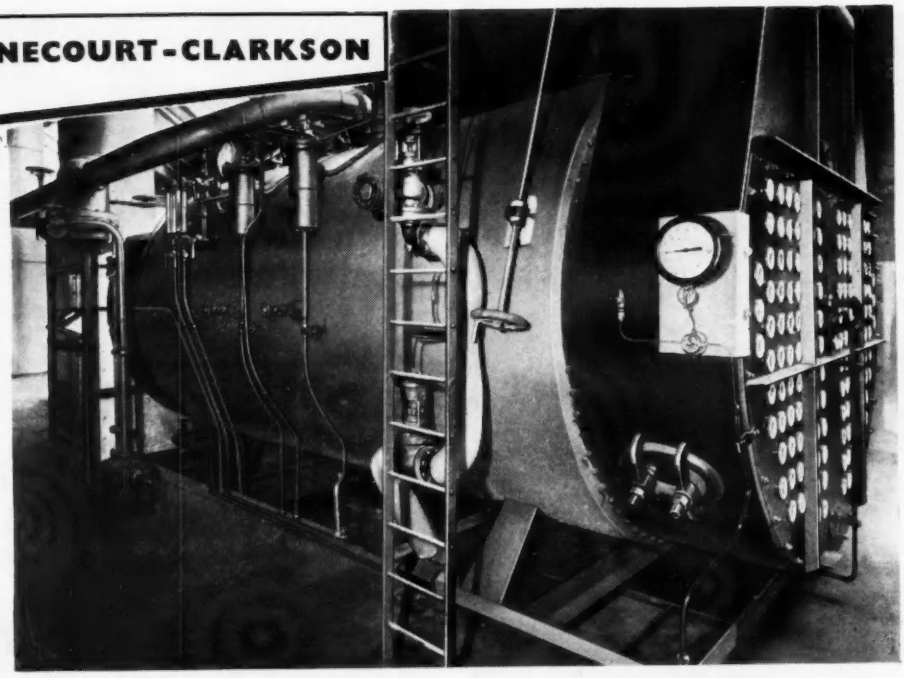

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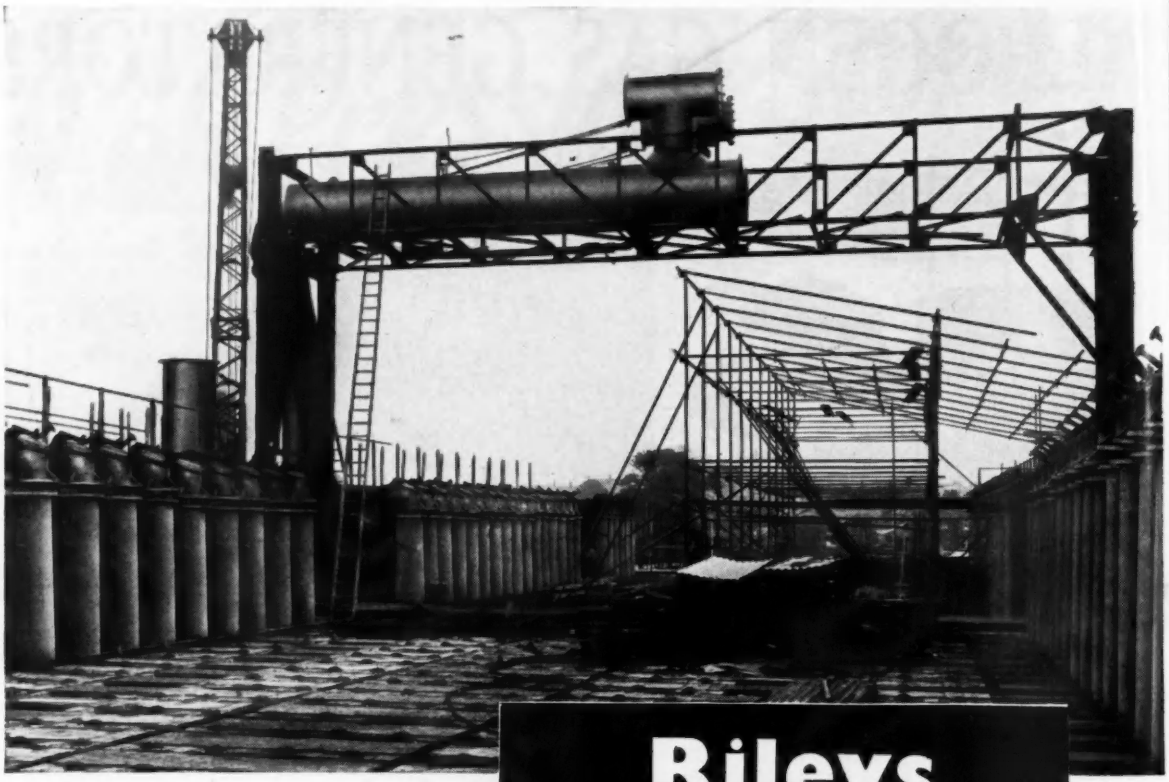

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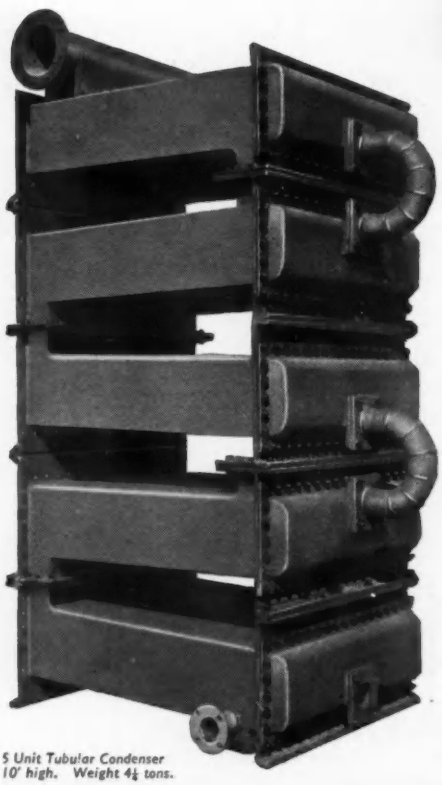

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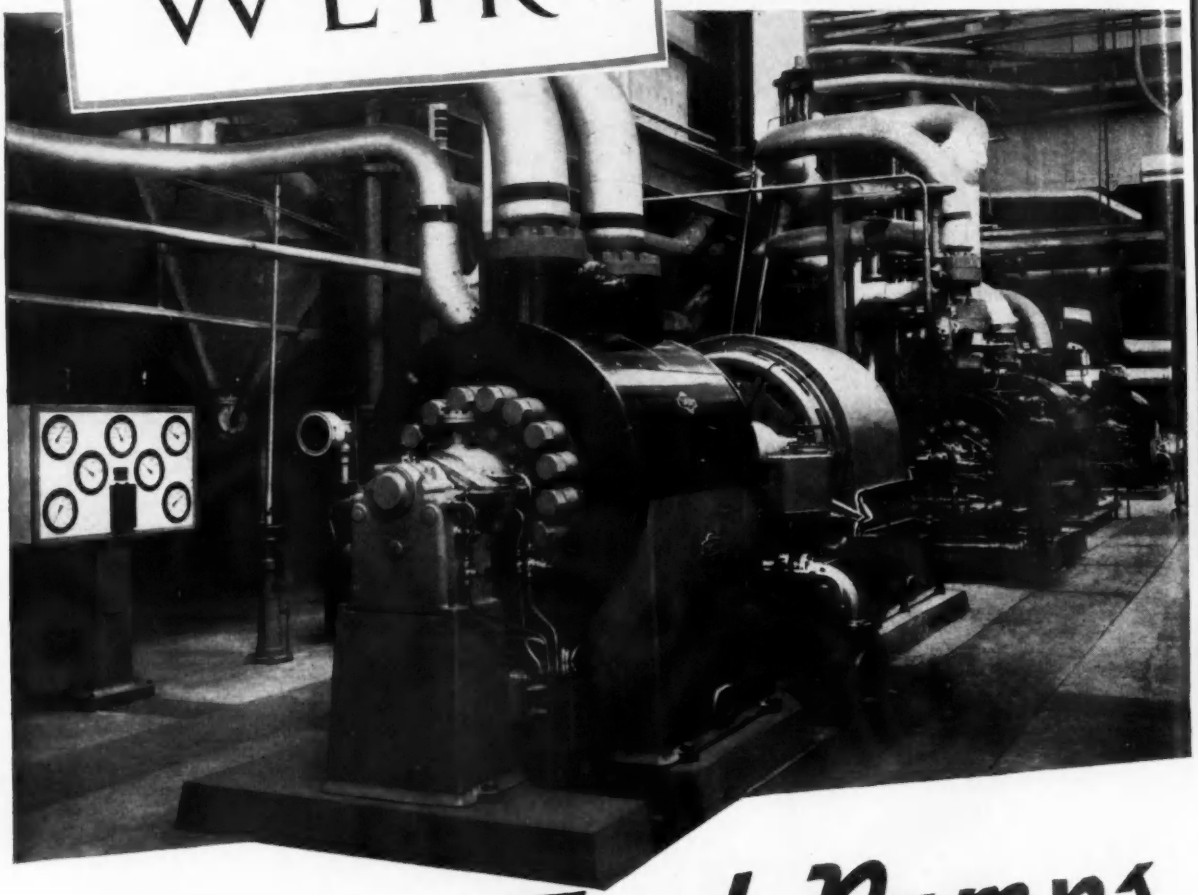

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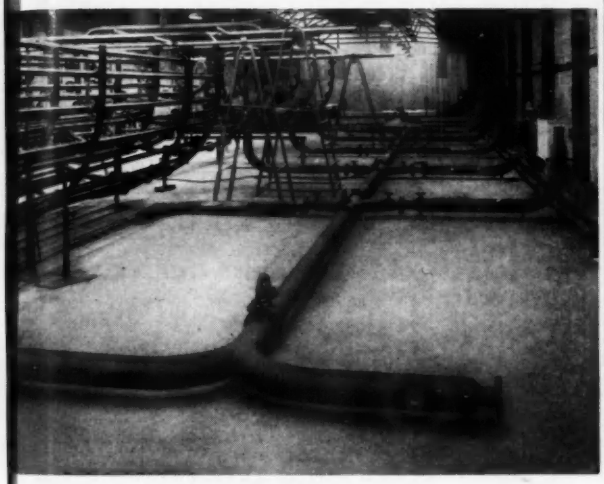

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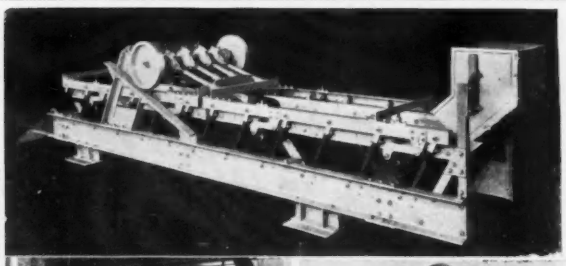

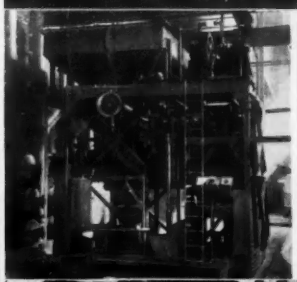

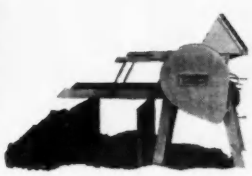

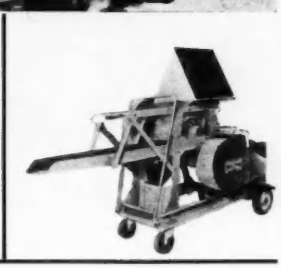

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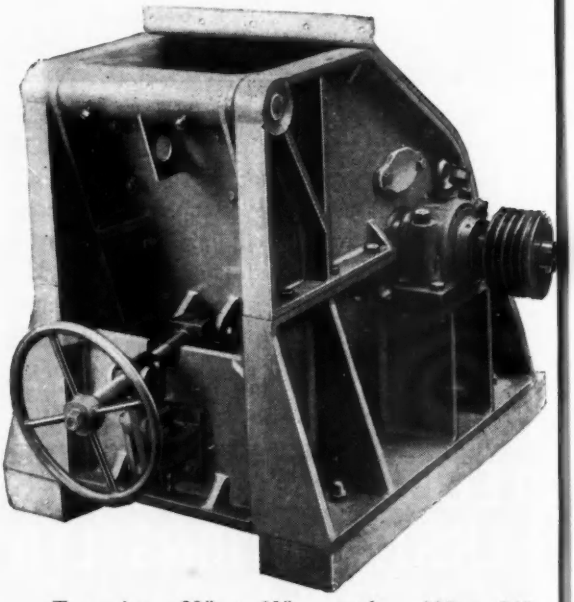

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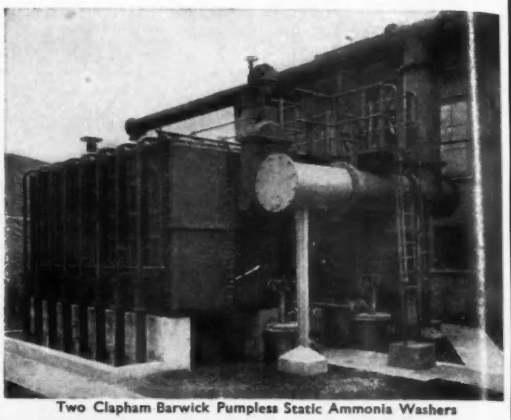

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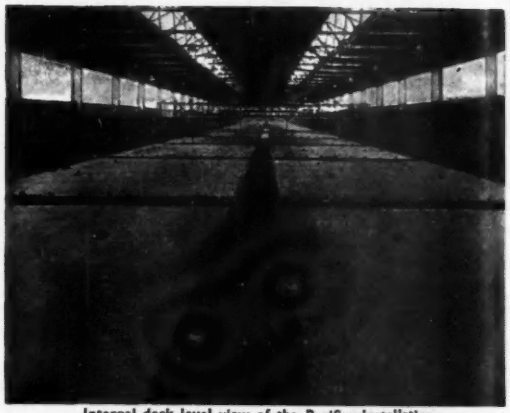
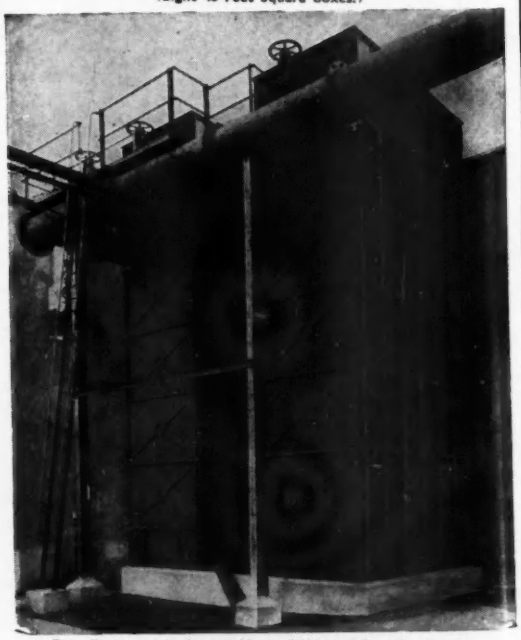


Internal deck level view of the Purifier Installation. (Eight 45 Feet Square Boxes.)



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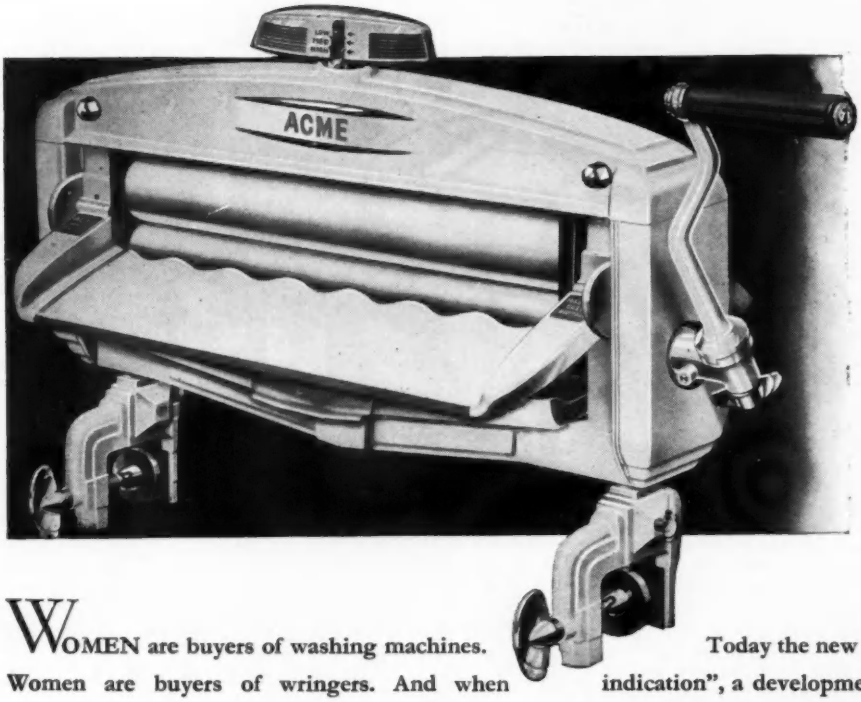

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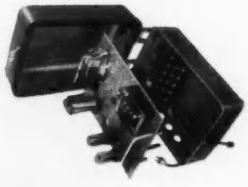

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Gas Journal

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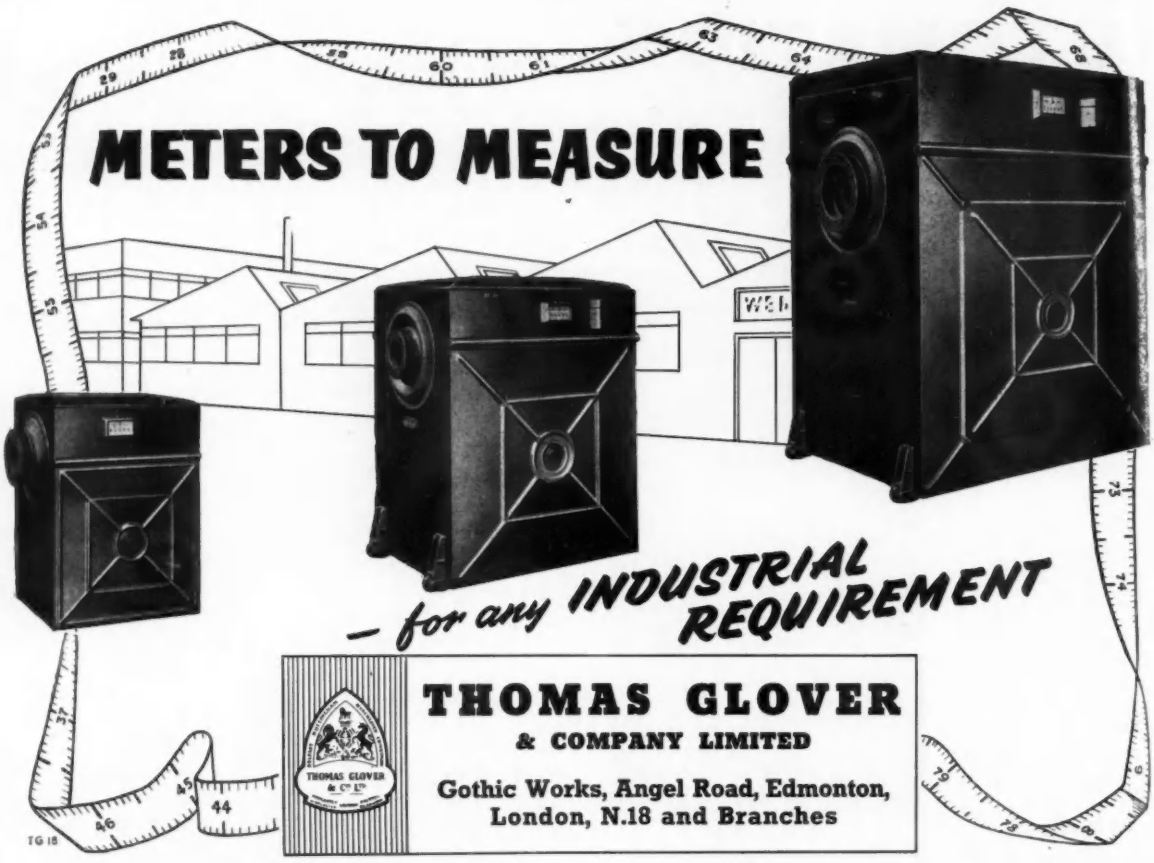

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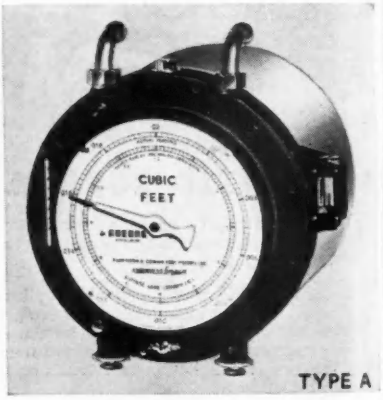

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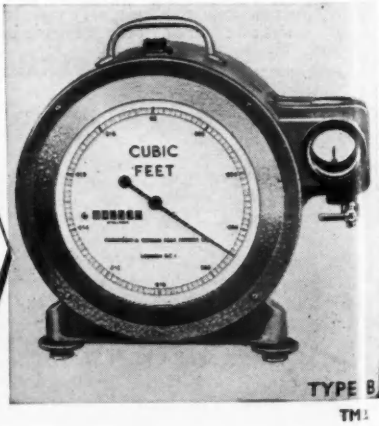

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Gas Journal

VOLUME 284. No. 4827. DECEMBER 7, 1955. 107th YEAR

The Effluents Problem

THE three papers submitted to the Autumn Research Meeting on this subject contain very much more than the gas engineer will require to assimilate or even to understand except in a general way. *Comm. GC24*, for instance, by Dr. Blackburn and his team at the University of Leeds, may be looked upon as an immensely valuable piece of fundamental research. It follows on *Comm. GC17* presented in 1954. 'The investigation into the identification and determination of the amounts of the various organic compounds that are present in ammoniacal liquor has been continued' —a matter that is of interest to the gasworks chemist and the sewage purification expert rather than to the engineer. No attempt is made to 'popularize' the subject. Nor should we complain, for this is a paper for the specialist. Most of us will be content to admire the vast amount of scientific ingenuity which has been brought to bear on this tremendously complicated problem and to feel sure that it will prove immensely valuable to workers in the field of effluent treatment and disposal.

In *Comm. GC25* Dr. Blackburn and his collaborator, Mr. T. G. Tomlinson of the Water Pollution Research Laboratory, give the final results of their work at Stivichall 'on the treatment of gas liquor(s) in admixture with sewage in percolating filters,' a continuation of *GRB Report 63* presented in 1952. It will be remembered that in this work it was sought to divide the liquors into several fractions and to ascertain the effect of each on the sewage purification process. 'The present paper gives the results of similar experiments with spent liquor from Hinckley gasworks where electric detarring of the hot-gas is practised and the retort-house liquor and purifier condensate are disposed of separately.' It is this latter condition which prevents the results from being decisive on the value of hot electro-detarring. The research into this question promised by Professor Roberts and Dr. Blackburn in *Comm. GC18* last year has now been started. The report of this will be awaited with considerable interest, if only because some planning engineers have already installed hot-gas tar precipitators in anticipation of favourable results.

Mr. Badger's paper, *Comm. GC26*, on 'The Bacterial Oxidation of Gas Liquor,' describes work directed to the development of effluent treatment at the gasworks. It is a phase in the discussion whether the effluent should be treated at the source or at the sewage works. It must be treated somewhere and wherever it is treated it will cost money. One obvious advantage of treatment, or at least pre-treatment, at the gasworks would appear to be the very much smaller volume of the particular liquid to be handled. It should also be possible to treat the retort-house liquor and purifier condensate separately, the advisability of which seems to be indicated by the experiments with the Hinckley liquor.

In one short paragraph of his paper Mr. Badger sets out the four possible ways in which gasworks liquor may be treated; added to the general stream of influx to the sewage works (controlled flow, etc.), purified by various physical or chemical means, fed to the land as a fertilizer, or treated by bacterial oxidation on the gasworks. Mr. Badger has addressed himself to the last of these. The results of his work are very promising indeed, at any rate, technically. Finality has not been reached. It is not therefore surprising that costs are not even indicated. A warm tribute to the value of Mr. Badger's work came, during the discussion, from one well-qualified to speak, namely, Mr. T. G. Tomlinson, who thought Mr. Badger had established beyond doubt that it was quite possible to achieve, at gasworks, almost the same degree of purification as could be achieved at sewage works with liquor of the same strength. In view of the stubborn nature of the gasworks effluent problem and the importance of its solution to the gas industry the results so far obtained provide a source of lively encouragement for the future.

The very full attendance at the presentation, swollen as it was by visitors from the Coke Oven Managers' Association and several sewage purification specialists, was an indication of the very great interest excited by this problem. The discussion was searching and thorough but much of it came from the coke oven side where the problem is not nearly so difficult. The difference between vertical retort effluent and that from coke ovens is indicated by the figures for the oxygen-absorption value. Mr. Illingworth suggested that while spent liquor from vertical retorts might have an O/A figure of 10,000 parts per mill., that from coke ovens might run at no more than from 1,800 to 2,000 parts per mill. The merit of Mr. Badger's work is that he chose the most difficult of the liquors for his experiments.

It emerged from the discussion that the whole problem is being vigorously pursued along several different lines and at several different places by men whose names justify confidence that, soon, it will be completely solved.

'Administrative Structures'

THE decline of an industry can be arrested and progress initiated by the creation and growth of special administrative structures—some the responsibility of scientists and engineers—Mr. A. H. A. Wynn, Scientific Member, National Coal Board, told the Royal Institute of Public Administration recently. He was discussing the 'momentum of decline' in the coal industry and stressed the factor, peculiar to an extractive industry, that because of the gradual exhaustion of reserves of mineral in each individual mine, the productive capacity of the coal industry declines by two or three per cent. every year, if there is no large scale reconstruction and no new collieries re-opened.

But to return to Mr. Wynn's 'administrative structures' thesis. On the face of the remark there appears to be a certain *naïvete*. What on earth else are nationalised industries—and that includes the 'black sheep' the Coal Board—if not structures designed to co-ordinate scientific, engineering, and administrative functionaries to the best advantage? However, what Mr. Wynn probably attempted to do was to avoid direct criticism of his own Board. He could not directly admit that this particular administrative structure had failed. The decline continues and the coal industry is in the peculiar position of being still the most important, nationally, while at the same time the most adversely affected in the light of manpower shortages in all grades from the unskilled to the scientific. Mr. Wynn went on to point out just what difficulties the Coal Board faces. He also described some subsidiary 'administrative structures' such as the Coal Survey—a pre-nationalisation idea—the Planning Branch and the Geological Survey. Mr. Wynn said that the difficulty in creating a strong and efficient Planning Branch had been another factor in the momentum of decline that the Coal Board had been called upon to reverse.

One of the most interesting figures Mr. Wynn gave us was that the Coal Board's present expenditure on mining research and development was less than one-tenth of 1% of turnover; a very low figure compared with other industries. The Board's plans for expansion were limited primarily by the rate at which men of sufficient ability could be recruited. We conclude by quoting Mr. Wynn's clear warning: 'Much will depend, however, upon this research and development in the years to come. The industry is certain to find it increasingly difficult to recruit unskilled and semi-skilled labour. The ability to increase or even maintain present production will be determined to no small extent by the rate of mechanization that can be maintained. There is, indeed, a race between mechanization and falling manpower in the mines.'

SCIENTIFIC CONTROL IN LIVERPOOL

THE evolution of laboratory facilities and their organization in the Liverpool Group of the North Western Area have followed the lines of development already initiated in this region by the succession of wise administrators of the Liverpool Gas Company. In 1948 Mr. Leach described a Central Laboratory under the control of the Chief Chemist which 'while maintaining liaison with the (several) works, carries out the analysis of coals, cokes, benzoles, tars, oxides, *etc.*, and also controls instrumentation and development.' Its advantages were that, 'whereas four people previously analysed any one item at the four production locations,' each item was now the duty of one person only. 'By aggregating similar routine duties previously carried out part-time by senior men, it has been possible to transfer such work to juniors as their whole-time duty,' freeing the senior men for work more commensurate with their capabilities. It speaks volumes for the wisdom of the North Western Gas Board that this development has been permitted and indeed encouraged towards its logical conclusion in the organization described by Mr. L. G. Townsend in the paper he presented recently to the Manchester and District Section of the I.Gas E. This paper and the discussion which followed was reported in our issues of November 23 and 30. The paper may be considered as one facet of the general picture, drawn by Mr. Hubbard in his Presidential Address of last April, of the technical organization of the Liverpool Group.

The general picture is that while the works laboratory is retained for those quick and fundamentally approximate analyses which are essential to plant operation, giving the necessary information to guide daily, and often hourly adjustments, the Central (Group) Laboratory has a wider range of activities. Particularly is this seen in the analysis of gases where 'it is very doubtful if the complete analysis of make gases as a routine operation can be justified, since the interpretation of the results is by no means easy.' The Works Chemist is not deprived of his complete responsibility for the day-to-day operation of the plant within his purview, but has the backing of the Group Laboratory for the more accurate and detailed information upon which long-term policy can be based. It seems to be good policy to send anything which can be sampled to a central fully-equipped laboratory where samples can be examined at leisure and with a care commensurate with that bestowed on the selection of the sample. The Central Laboratory, too, is the appropriate scene of such general examinations and investigations as are described by Mr. Townsend. Interesting among these is the 'collection and dispatch of all germanium-bearing flue dust.'

Another very appropriate activity is the supervision, standardization and maintenance of instruments throughout the Group. It is now generally recognized that instrumentation is useless unless the apparatus is under continuous supervision. 'It is surprizing to find that at the present time there are no less than 1,300 instruments on the production side of the group.' Clearly the upkeep of such a quantity of equipment—which does not include such items as ordinary thermometers and pressure gauges—is a major operation. The reports of results and information, upon which policy must be based, is another activity which can only be justified on the scale of a large Group such as we see at Liverpool. And to this is very appropriately added a Central Library for the assistance of technical staff at all responsible levels.

The contribution made to the discussion by Mr. Pickering, Area Chief Chemist of the West Midlands Gas Board, could not fail to be of interest. He thought that much of the work done by the Group Laboratory at Liverpool might well be undertaken by an Area Laboratory, since it is 'work of interest and value to all or the majority of undertakings in the Area.' No doubt there is cogency in his contention. At the same time there is always the danger in over-centralization of moving the point of investigation too far from that of its immediate relevance. No doubt the heavy concentration of population and industry in the three Divisions of the West Midlands Area in and around Birmingham makes the centralization of scientific control in an Area Laboratory more appropriate to that particular Area.

A very nice question which arose out of the discussion on the recruitment and advancement of chemical staff, was

whether the chemist should look for promotion in the engineering side of the industry, if he was to secure a status and remuneration commensurate with his ability. It appeared to be agreed that this was not, in general, desirable and that the status and salary prospects of the chemist should be such as to attract and maintain a staff of scientists equal to the important duties imposed upon them. 'Costly modern plants,' said Mr. Pickering, 'will not give of their best unless they are controlled by skilled technicians directed by men of the highest administrative and scientific ability whether they be engineers, chemists or physicists,' and we would say that the gas industry today calls for men of all three essentially different abilities. Mr. Cooper, of W. C. Holmes, thought the paper should have illustrated the fact that the boundary between the professional engineer and the professional chemist was being progressively lowered.

Mr. Townsend's experience with the recruitment of his staff excited a good deal of interest. He found it practically impossible to obtain chemists of degree standard, but he seemed to be getting on very well with boys and girls of his own training. He appeared to be able to bring them up to Higher National Certificate level and 'it was occasionally possible' to release one of this standard 'for full-time intensive courses for A.R.I.C. lasting for nine months' and this, he thought, was probably 'the best means of obtaining qualified chemists with gasworks experience.' Dr. L. G. Burrage, a distinguished visitor from I.C.I., Ltd., thought Mr. Townsend was a little rough on his female staff in that he used them for routine work in which they were 'found reliable,' but considered that they rarely had any but the most limited aspirations and that any desire for responsibility was rarely evident. Dr. Burrage, on the other hand, found that up to the age of 23 a first-class girl straight from school was superior in research work to a first-class boy. 'Get girls interested in their jobs and they would become first-class assistants.'

THE CHAIRMEN'S TECHNICAL REPORT

THE Chairmen's Technical Committee, to which a brief reference was made in our last issue, have the onerous and not very spectacular duty of reviewing and setting before the gas industry the results of the vastly important but largely routine work of those devoted men of the industry who keep watch over the risks and difficulties which arise in the daily manufacture and distribution of gas and in the disposal of waste products. As Mr. Tate put it, 'These activities cause but the smallest of ripples in the lake of our affairs', but none the less this somewhat prosaic Report is 'an account of inspired and devoted work by groups of professional men who, for the advancement of our industry, and in addition to their already heavy burdens, are happy to give of their unique experience in many fields of gas engineering practice'.

Among the more important items in this work are the revised 'Recommendations for the Inspection and Maintenance of Gasholders' which are published as a supplement to the Report. Mr. H. G. Hall described the lines upon which they have been drafted, particularly to meet the requirements of the 1937 Factories Act which, 'clarified by that of 1948 has made the inspection of gasholders a statutory obligation'. Part I of the recommendation sets out all the possible applications of the Acts, and of the numerous regulations made under them, to gasholders both in operation and under repair. Their notes should be warmly welcomed by the practical man, for they are written not in the stiff wording of legislation but in more general and more understandable terms. A gasholder under repair becomes legally a 'work of engineering construction . . . a factory in its own right,' and in this part a selection is given of the provisions of the Acts which apply to such works. The other three parts cover in detail the provisions as they apply to the several types of holder—the water-sealed, the waterless (of the piston and, for the first time, of the Wiggins types) and the high pressure holders. Stress is laid upon the recommendation to purge with inert gas whenever major repair work is undertaken.

Several interesting suggestions have been made from time to time for methods of detecting thin spots in gasholder plating alternative to that of repairing a sample. The use of ultrasonic beams is specifically mentioned, but Mr. Hall assures us that other methods were considered; 'it was felt that as yet experience was insufficient to permit recommendations to be made.' The whole of this work is a very fine example of co-operation between technicians of the industry and those of builders, contractors and insurance companies.

The importance of the work of the Pipes Committee cannot be overestimated. It deals with an aspect of distribution and supply where the industry comes under a withering fire of public criticism—'the fracture of gas mains particularly during prolonged periods of cold weather'. Col. Gould called attention to the importance of receiving and collating as much information as possible on this subject and on that of the older mains 'to enable a sound statistical analysis to be made'. The new 'Recommendations to Prevent Accidents during the Cutting out of Gas Mains for Repairs and Alterations' and those concerning flexible joints for cast iron mains, given as Supplement 3 to the Report, cover other aspects of this important subject, while there is promise of much more to come, including the preparation of a manual of recommended practice in main-laying.

All this comes under the heading of Safety Rules and it is vastly encouraging to be assured by Mr. Battersby, as indeed will have been inferred by those who read the relevant report presented to the International Gas Union on Safety Regulations for Gasworks, that no country 'possesses such a comprehensive schedule of recommendations for the guidance of its gas engineers, or has produced such a convenient reference to official regulations, standards and codes of practice . . . as are available to the British gas engineer through the work of the Institution and its Committees.'

COMFORT AND BACHELORDOM

EVERY winter thousands of people in this country regret the legacy of draughty, ill-designed homes built by the Victorians and later generations who had a great aptitude for making themselves believe that English winters are not cold. The problem of heating such homes is very real, particularly when costs of installation are as high as at present. It is in these older homes, too, that gas has a considerable advantage over its rivals; whereas new electric wiring might be entailed, gas points may well be found in profusion. Produced at a very appropriate time of year is the booklet published by the Good Housekeeping Institute in collaboration with the Gas Council and dealing with the problem of heating the home. Entitled *Comfort in the Home*, it is one of two companion volumes, priced at 1s. 6d. The booklet discusses warmth and comfort for every room in a house or flat, and methods of heating are explained in great detail. A wide choice of gas water heating and space heating appliances are described and illustrated. The companion volume, *Cooking for One*, offers a challenge to bachelors of either sex who are faced with problems of solo cooking. Dishes and menus are set out, and the equipment required, such as gas rings and small cookers, suitable for small flats and bed-sitting rooms, is described.

Personal Notes

DR. HAROLD HARTLEY, C.B.E., the Chairman of Radiation, Ltd., will, at his own request, relinquish the office of Chairman at December 31, 1955. His successor will be the present Deputy Chairman, Mr. W. Donald King. Dr. Hartley will retain his directorship of the Company.

MR. G. R. BLAKELY has been appointed to the Board of Directors of G. A. Harvey & Co. (London), Ltd., as works director. Mr. Blakely joined the company as general works manager in 1952.

MR. E. S. PETTYJOHN, Director of the Institute of Gas Technology, affiliated with Illinois Institute of Technology since 1945, has announced his resignation. DR. HENRY R. LINDEN, Research Director, will serve as acting director until a successor to Mr. Pettyjohn is selected.

MR. P. J. C. BOVILL, an assistant managing director of Newton Chambers and Co., Ltd., has accepted an invitation to join the Board of the Wellman Smith Owen Engineering Corporation. For a number of years there has been a close association between the two companies.

MR. M. D. EDINGTON has been appointed Carbonization Director of the Durham Division of the National Coal Board. He is at present General Manager of the Division's Carbonization Department. This appointment is made following the recommendation of the Advisory Committee on the Board's Organization (the Fleck Committee) for the strengthening of the Board's Carbonization Department.

MR. G. W. ALEXANDER, has been appointed Chief Engineer of Powell Duffryn, Ltd. Mr. Alexander will, accordingly relinquish his executive responsibilities in Powell Duffryn Technical Services, Ltd., and steps are being taken to appoint his successor. He will, however, continue to be a member of the Board of that company. Mr. Alexander, Mr. W. MESSER and MR. G. W. DAVIDSON have been appointed directors of the Rhymney Engineering Company, Ltd., which is owned jointly by Powell Duffryn, Ltd., and International Combustion (Holdings), Ltd.

MR. J. P. LAWSON, Manager of the North Western Gas Board, has retired after 50 years' service. Recently a presentation of a fireside chair was made on behalf of Whitchurch employees. Mr. R. B. SMITH, Production Engineer, Northwich Group, said that the family had a remarkable record of service to the gas industry. Mr. Lawson's father and grandfather had served some fifty and thirty years respectively, and this tradition was now being continued by Mr. Lawson's son.

MR. W. W. CHESHIRE, for eight years Managing Director of A. G. Sutherland, Ltd., gas meter makers of Greet, Birmingham, retired from that office on November 30. He began his career in the gas industry at Messrs. Parkinson & Cowans, Bell Barn Road Factory, in 1906. There, he studied the whole of the intricate subject of gas meter manufacture and practice, of which he is an acknowledged expert. In 1935 he joined the Owen Organization as a representative of A. G. Sutherlands, Ltd., and in January, 1947, he was appointed Managing Director of that Company.

Diary

December 9.—LONDON AND SOUTHERN JUNIORS: 'Materials Handling in Gasworks,' F. R. Waple, 178-180, Edgware Road, London, W.2. 6.30 p.m.

December 9.—MANCHESTER AND DISTRICT SECTION, I.G.E.: Joint meeting with Institute of Fuel. Short papers: 'Coke Manufacturing Problems,' Dr. G. E. Foxwell; 'Coke Utilization,' E. H. Coley; and 'Smoke Problem,' Dr. A. Semple. The Engineers' Club, Albert Square, Manchester. 2.30 p.m.

December 10. — YORKSHIRE JUNIORS: 'Industrial Gas,' F. Dickinson, Sheffield.

December 12.—INCORPORATED PLANT ENGINEERS (Dundee Branch): 'Tar Distillation Plant,' R. M. Crighton, Mathers Hotel, Dundee. 7.30 p.m.

December 12.—INSTITUTE OF FUEL: 'Complete Gasification of Coal,' Dr. F. J. Dent. Chemistry Lecture Theatre, King's College, Newcastle-upon-Tyne. 6.30 p.m.

December 12. — MIDLAND JUNIORS: Joint meeting with the Wolverhampton and District Engineering Society. 'Heavy Oil Gasification,' R. B. Brown, R. S. Hackett, R. B. Hobson. Gas Showrooms, Wolverhampton. 7.30 p.m.

December 13. — EASTERN JUNIORS: 'Deep Purification,' W. Hayston and D. G. Wright, Peterborough.

December 14.—INSTITUTE OF FUEL: Joint meeting with the Institution of Heating and Ventilating Engineers. 'Fuel Forum,' Exchange and Engineering Centre, Stephenson Place, Birmingham. 6 p.m.

December 14.—INCORPORATED PLANT ENGINEERS: East Midlands Branch (Joint meeting with Institute of Fuel): 'Grit and Dust Collection,' J. R. O'Breen. County Hotel, Theatre Square, Nottingham. 7 p.m.

December 15.—MANCHESTER JUNIORS: Short papers in competition for the F. Johnston Prize. Gas Showrooms, Manchester.

December 15.—INSTITUTE OF FUEL: 'Instrumentation of Boilers,' R. Clare, Liverpool Engineering Society, 9, The Temple, Dale Street, Liverpool. 7 p.m.

December 16.—WALES G.C.C.: The Castle, Shrewsbury. 2.15 p.m.

December 20.—LONDON AND SOUTHERN I.G.E.: 'Some Thoughts on Industrial Relations,' P. Valon Bennett, Junior Institution, Pepys House, 14, Rochester Row, London, S.W.1.

December 29.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, W.C.2. Includes visit to Research Centre at Fulham. 2.30 p.m.

January 4.—INSTITUTE OF FUEL: 'Some Coal Research Problems and their Industrial Implications,' R. L. Brown, Institution of Civil Engineers, Great George Street, S.W.1. 5 p.m.

January 6.—LONDON AND SOUTHERN JUNIORS: 'Next Slide, Please!'—an aid to the presentation of technical papers, R. N. Le Fevre, 178-180, Edgware Road, London, W.2. 6.30 p.m.

January 9.—INSTITUTE OF FUEL, NORTH EASTERN SECTION: Four short papers: Case Histories, by the National Industrial Fuel Efficiency Service. Chemistry Lecture Theatre, King's College, Newcastle - upon - Tyne. 6.30 p.m.

The finding that there had been no negligence on the part of the Scottish Gas Board or any of its employees was returned by the jury at an inquiry at Peebles Sheriff Court into the deaths of two elderly sisters, Maggie and Elizabeth Cairnie, who were overcome by gas fumes in their house at 9, Douglas Street, Paisley, in October.

Blackburn Residents want the old lamplighter with his long pole for lighting and extinguishing the lamps back again. Councillor G. Gillibrand has told the Council that people say the gas lamps never seem to light up at the right time. Mr. G. Wightman, the borough Coroner, in the capacity as an ordinary ratepayer, has referred to one lamp which is lighted all day and goes out at night. The situation is to be thoroughly considered by the Lighting Committee.

21st AUTUMN RESEARCH MEETING

Gasworks Effluents

A report on the three effluents papers presented to the AUTUMN RESEARCH MEETING of the INSTITUTION OF GAS ENGINEERS on November 22, and on the discussion which followed two of them.

AT a crowded meeting in the Hoare Memorial Hall with Mr. H. F. H. Jones, Vice-President, in the Chair, three papers on effluents were presented. The first, *Comm. GC24*, 'An Investigation into the Composition of Ammoniacal Liquor' (Blackburn, Barker, Catchpole & Hollingworth), was presented without discussion by Dr. Barker. It is a continuation of *Comm. GC17* presented in 1954. Two groups of components have now been analyzed in addition to the monohydric phenols considered previously.

The group containing polyhydric phenols has been found to include 17 dihydric and two monohydric phenols, the proportions of which have been determined, together with an indication of the pressure of several other compounds, the identities of which have not yet been definitely established. Analysis of the group of compounds separated as 'carboxylic acids' has shown that nearly 85% of this material consists of phenols.

The techniques of chromatography on paper and on columns containing silica gel have been adapted to the separation of polyhydric phenols, the amounts of substances being determined by ultraviolet spectrophotometry.

Over 80% of the total organic material extracted from liquor has now been identified. Of the remainder, it is considered that only about 3% can be estimated in the form in which it existed in the liquor, this comprising the neutral oils and the bases. The rest of the material, consisting of phenolic pitch, and also the 'humic acids,' are probably substances not present as such in the liquor, but are produced by reaction between simpler compounds during the process of separation.

About 82% of the organic constituents of a vertical retort liquor have now been identified and determined. These consist (expressed as a percentage of total organic extract) of monohydric phenols, 55.7%, dihydric phenols, 28.6%, phenol pitch, 10.3%, carboxylic acids, 1.9%, humic acids, 0.9%, neutral oils and bases, 2.6%.

Comm. GC25, 'The Treatment of Gasworks Liquor in Admixture with Sewage in Percolating Filters' (Blackburn, Tomlinson and Hall), was presented by Mr. Tomlinson. It gives the final results of the work by the Water Pollution Research Laboratory in collaboration with the Gas Research Laboratory (Leeds) so far reported in *GRB Report 63* (1953) at the Stivichall Sewage Works of Coventry Corporation.

The previous work showed that spent liquor from Coventry and Leamington had an appreciable effect on the quality of the treated sewage effluent when added to sewage in a concentration of 0.5%. These experiments were continued, as now reported, with spent liquor from Hinckley gasworks where electro-detarring of the hot gas is practised and where the retort house liquor and purifier condensate are disposed of separately. This liquor differed from that from Coventry and Leamington in having much lower contents of higher tar acids, thiocyanate and fixed ammonia; the concentration of monohydric phenols was somewhat higher and the total oxygen absorption values of the two types of liquor were about the same. The experiments showed clearly that Hinckley spent liquor was more easily treated than that from Coventry or Leamington. For example, this liquor increased the biochemical oxygen demand of the effluent only at the highest rate of application, viz., 2 gal. per cu. yd. per day.

The spent liquors from Coventry and Leamington included all the liquors produced, and part of the improvement in the Hinckley liquor may be ascribed to the exclusion of the retort house and purifier liquors. The experiments now in progress at Leamington will show to what extent the improvement was due to the exclusion of the other liquors and to what extent it was due to the effect of hot gas detarring.

The separate disposal of the retort house liquor as practised at Hinckley is not feasible for large gasworks situated in urban areas, but the possibility does exist of treating this relatively small volume in some way before mixing it with the rest of the liquor and subsequently discharging it to the sewer. The experiments described in Section IV of the paper showed that solvent extraction followed by distillation in the presence of lime effected a considerable improvement in the liquor.

Results obtained with different fractions of vertical retort liquor from Leeds are in general agreement with those previously reported and emphasize the importance of the liquor residue after extraction of the phenols. This residue contains all the ammonia and thiocyanate. Both the work on this liquor and on Hinckley retort house liquor indicated that ammonia is one of the most important constituents of gas liquor in sewage disposal. It is also very important in the pollution of rivers since recent work carried out at the Water Pollution Research Laboratory has shown that relatively low concentrations of undissociated ammonia are toxic to fish.

DISCUSSION

The discussion on this paper was opened by **Dr. S. H. Jenkins** (Chief Chemist, Birmingham, Tame and Rea District Drainage Board), who said that the experiments described by the authors and those which are being carried out by other workers at a number of different centres leave no room for doubt that within a few years it should be possible to forecast the effect of a variety of gas liquors of given composition on sewage purification processes. At the same time, there is every indication that the work which has been done at Leeds on the composition of gas liquor and the effect of different processes of gas manufacture on the composition of the liquor will suggest methods of operating gas purification plant so as to make use of the knowledge we now have on the effects produced by different liquor constituents.

For instance, although many local authorities have been prepared to accept up to 0.5% of spent liquor into their sewers, some gas engineers seem to have been under the impression that such an amount was without effect; whereas the author's large-scale experiments at Stivichall show that at a time of the year when conditions favour biological oxidation on filters the spent liquor from Coventry or Leamington raised the impurity content of the final effluent by as much as 50%. Since the Hinckley liquor at a concentration of 0.5% caused no such deterioration, it is obvious that the constituents in the Hinckley spent liquor are easily oxidizable.

One of the chemical criteria by which the quality of an effluent may be measured is its nitrate content, since the nitrate present in an effluent is produced by biological oxidation of ammonia, and this usually occurs when the filter is giving a good performance as measured by other tests. Dr. Jenkins said he noticed that the authors suggested that 2% of Hinckley liquor seemed to inhibit nitrification, although from a study of their results it seems that 0.5% seemed to improve it and 0.84% had no effect. He suggested that these variations in nitrate content of the effluent might have little to do with the gas liquor content of the sewage. Fluctuations of this order may occur, and they had certainly found them to occur, in a dozen filters operated under identical conditions.

In experiments which are likely to be carried out in the near future, in co-operation with the West Midlands Gas Board, they were proposing to overcome some of the errors inherent in carrying out small-scale biological filtration experiments by having 48 filters which will be used in triplicate for each test.

Mr. J. J. Priestley (W. C. Holmes) asked Dr. Blackburn whether he attached any importance whatever to the so-called 'burette aeration test' to which Dr. Blackburn replied that

'he did indeed; it was a very useful working test as long as you did not read too much into it.' It was not, however, a direct measurement of higher tar acids in liquor; it measured the amount of oxygen consumed in certain standard conditions of the alkaline solution. Mr. Priestley proceeded to put a number of questions in detail. He announced that at a large new works in the Midlands a plant was ordered some time ago for the solvent extraction of retort house liquor by methyl-isobutyl-ketone. In it the crude phenols will be recovered by caustic washing and disposed of as sodium phenolate solution. Purifier condensates tended to be forgotten in discussions of effluent disposal. They could be formidable both in quality and quantity. It would be interesting to know how they would behaved during biochemical oxidation and he suggested this as a further experiment.

Mr. S. C. Porter (West Midlands Gas Board), discussing the effect of lime treatment, said that in the Swan Village liquor treatment plant where 90% of the monohydric phenols and 30% of the dihydric phenols are removed by oil-washing, followed by concentration of the extracted liquor, a brown deposit slowly settles in the effluent storage tank. He suggested that the presence of lime, quite apart from any influence it might have in modifying the phenols, acted as a nucleus for the immediate removal of the deposit from the liquid phase, thus accounting in part for the observed effects on sewage effluent.

Mr. Porter then considered the relation between residual dihydric phenols and the thiocyanate and thiosulphate contents. The data in the paper were, he suggested, circumstantial evidence that in the absence or virtual absence of dihydric phenols thiocyanate was more difficult to oxidize in admixture with sewage. He did not overlook the fact that the residual dihydrics were known to be difficult to oxidize, presumably because of their altered nature in treatment, and it might well be that this was of overriding importance. It was an aspect that merited further investigation in his view.

Mr. Tomlinson agreed with Dr. Jenkins that variations did occur in the individual characteristics of filters. This fact introduced an element which, with the calculations, had to be taken into consideration. They were looking forward to further results from Dr. Jenkins work with filters in triplicate. He could not deal fully, of course, with all the points raised by Mr. Priestley, but on the subject of variations in the performance of filters, particularly those exposed to the weather, a certain amount of that variation could be attributed to such factors as temperature, surface ponding and variations in the composition of the sewage. Roughly speaking, there was a relation between the strength of the sewage treated expressed in terms of, say, the permanganate value, and the effluent produced. Mr. Priestley's very interesting comments on the presence of substances insoluble in the solvent in fraction G might lead to the solution of this particular problem. Mr. Porter's comments, too, needed consideration before they could be answered adequately.

Dr. Blackburn assured Mr. Priestley that they were not overlooking purifier condensates. It was well known that they were a major source of thiocyanate and they had been looking at purifier condensates from that point of view. He went on: 'We are carrying out a number of experiments using the activated sludge process on pure solutions of ammonium thiocyanate and ammonium thiosulphate, and again for mixtures in which there is ammonium chloride present, and so on. When we tried under comparable conditions purifying condensates, the solution being diluted to be the same as in the other experiments with ammonium thiocyanate, we found it was more difficult to treat, but we then made a most interesting discovery. If we boiled this purified condensate before using it in the experiments, which does not get rid of any of the thiocyanate, it then behaves exactly as a solution of phenolic thiocyanate. You will at once see that there is some practical importance attaching to this observation. You should not add purifier condensate to the spent liquor before discharge to the sewers. If you are going to dispose of it through the sewers, it should go to the concentration of spent liquor plant.

Bacterial Oxidation of Gas Liquor

The third paper, *Comm. GC26*, 'The Bacterial Oxidation of Gas Liquor,' was presented by the author, Mr. E. H. H. Badger, of the London Research Station. It described experiments on the treatment of spent gas liquor from vertical retorts, and on some of its separate constituents, without dilution with sewage. The process resembled the activated sludge treatment of sewage, in that aeration was effected in glass vessels or tanks, and settled solids were recirculated. The object of the experiments was to develop a process for use in the gasworks itself.

The experiments showed that it was possible to effect a very considerable reduction in the O/A of undiluted gas liquor by bacterial oxidation in a tank process; the most favourable results being a reduction in O/A from 10,000 p.p.m. to 300 to 400. There remained, however, an organic residue which was very resistant to bacterial treatment. The tank effluent was, moreover, strongly coloured and the O/A was still too high for discharge into a river without further treatment.

Work at Slough on a larger scale in a surface aeration unit of 1,000 gal. capacity gave results similar to those obtained in the laboratory, though the destruction of thiocyanate was poor. The rate of oxygen uptake was, however, insufficient to permit oxidation in a reasonable time—a retention period of 14 days was necessary. A new pilot plant had been constructed in which a greatly increased rate of aeration was attained by blowing air into stirred, baffled tanks. Results so far indicated that the retention period was reduced by providing more intensive aeration than was usual in sewage purification practice.

Although complete oxidation of the thiocyanate had been achieved on many occasions, the process was easily upset and was much less reliable than the oxidation of the phenols. A multi-stage process would be studied to find out whether the prior destruction of the phenols resulted in an improvement in the oxidation of the thiocyanate. For the oxidation of phenol, the present indications were that 35°C. was a favourable temperature, but that 45°C. was not so favourable. At 55°C. the reaction seemed to be faster than at 45°C. but not so fast as at 35°C.

DISCUSSION

The discussion was opened by Professor F. C. Happold (Leeds University) who called attention to a number of points of detail. He suggested to Mr. Badger that he should seek to establish first a firm basis in terms of the optimum rate of feed which would give him maximum destruction of his phenols and thiocyanate over a sufficiently long period so that he would be quite sure that these solutions were not suffering from overloading. Then he could safely study the other variables and deduce from the resultants of variation the things which he wished to deduce and which they were most interested to know.

Dr. D. A. Hall (Durham Division, N.C.B.) described investigations and methods used in the treatment of liquor from coke oven plants. Work in Durham on the treatment of liquor in a froth flotation plant for coal had been described in a paper by Hall, Hook and Myers, presented to the Second Coal-preparation Conference at Essen last year. He agreed that the bacterial process seemed likely to provide the widest field for a cheap treatment process.

He had carried out an extensive laboratory investigation of ozonization. In every case this treatment was technically successful in destroying all phenols, thiocyanates, thiosulphates, sulphides and colour. Raw liquors from the Durham coke works required about 20 lb. of ozone per 1,000 gal. to destroy most of the chemicals, but there was still a residual O/A value. Liquors pretreated in a froth plant required about 1 lb. of ozone per 1,000 gal. which would add only a few pence per ton to the cost of coke.

Mr. T. G. Tomlinson (Water Pollution Research Laboratory) thought the major result of Mr. Badger's work was that he had demonstrated beyond doubt that it was quite possible to achieve at the gasworks almost the same degree of purification as could be achieved at the sewage works with liquor of the same strength.

Mr. F. K. Illingworth (N.C.B., N.E. Division) gave results with bacterial treatment in a pilot plant of the liquor from the Altham coke ovens pilot plant. A full scale plant was in course of erection there. It appeared that bacterial treatment in a plant of the activated sludge type would give an effluent that would be very easily dealt with by sewage works even where the latter served a smaller population than the carbonizing plant. **Dr. G. Coles** (N.C.B., East Midlands Division) also spoke from the coke oven point of view. Intensive investigation in their laboratories of coke oven still liquors on lines similar to those in the paper had given similar results. He thought,

(*Continued on p. 654*)

15

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Area Technical Services

A summary of the paper to the AUTUMN RESEARCH MEETING of the INSTITUTION OF GAS ENGINEERS by Mr. J. E. Davis, Chief Technical Officer, South Eastern Gas Board, and a report of the discussion.

MR. J. E. DAVIS, Chief Technical Officer, South Eastern Gas Board, referred in this paper (*I.G.E. Pub. No. 478*) to the first Annual Report of the Board in which was described the organization that had been set up to operate in the Area. Essentially the type of structure was line and staff, the two direct operating lines being headed by the Chief Engineer and the Commercial Manager. The pattern of technical services was most fully developed, as was to be expected, in association with the line organization headed by the Chief Engineer. Technical staff were necessary at operating level and works chemical staff came under the day-to-day control of the Station Engineer, although the methods they employed in their daily work were guided by the functional line. Each Divisional Engineer had on his staff a Divisional Chemist who acted as his assistant in scientific matters and matters of process control. The Headquarters' Area Staff included the Chief Technical Officer who was answerable to the Board for his particular staff function, while the Central Laboratories, under the Chief Chemist and the Chief Physicist, made their contribution at Area level.

Naturally, the extent to which technical services could be developed as a recognizably separate function must vary with the size of the unit. At the smallest works there was no separate member of the staff having technical duties, such testing work as was done being part-time, with a considerable measure of dependence upon either a neighbouring larger works or a divisional organization. Slightly larger works would employ one or more men wholly on testing work, but they could do no more than ask the question 'What?' leaving the 'How?' and the 'Why?' to others. The aim of the largest works (and in a few years' time there would be none but the large works remaining) was to build such a team as would be competent to answer the whole range of questions within the normal operational experience of that works. There it would be necessary to watch that the line of communication did not become broken, and that the large works were not allowed to be operated in technical isolation.

The line function headed by the Commercial Manager had not the same need for constant technical contact at the operating level. Primarily, the technical services were given by the Central Laboratories to the Commercial Manager and his staff at Headquarters, but experience had shown the need for frequent contact with divisional staff over the local problems and unusual experience. Reference was made in section V to the method of ensuring the flow of information, but there was no divisional technical organization as such, contact being made through Service Superintendents and District Managers.

Apart from these two lines, technical services were required, in some cases constantly and in others from time to time, by other functions. These services were given directly by the Headquarters' technical organization based on the Central Laboratories. These other functions included the Coke Manager, the Chemical Products Manager, the Chief Supply Officer, and the Coal and Shipping Manager.

The functions of the Central Laboratories had been outlined and their organization was adjusted to those functions. There were two main sections, the Chemical Section and the Utilization Section. At the head of the former was the Chief Chemist who had a special responsibility for the day-to-day running of his part of the Central Laboratories. The work was classified in three groups. The Utilization Section was headed by the Chief Physicist, who was responsible for the day-to-day working of that section and for relating its work to the several departments which it served. It might seem that the utilization problems of gas, coke, and tar formed a curious mixture, but they all had the common feature of being closely related to all consumer needs. Commercial considerations were common to all and the grouping of these apparently diverse interests had proved eminently successful. In this section there were four groups.

In both sections of the Central Laboratories the daily demands of the operating departments gave rise to experiment and investigation. These in turn generated ideas with varying degrees of novelty and usefulness, and at some indefinable point in the process an element of 'research' appeared. If success attended the experimental work it might become 'development,' and thus an organization intended primarily for service work, if it discharged its duties effectively, entered naturally into the sphere of research and development. The Gas Council Research Committee had recognized this outcome by adopting from time to time selected projects as part of its programme and accepting financial responsibility for them.

Mr. Davis mentioned some criteria of efficiency and quality. One of these was the system of regular returns. But the customary returns showed coal gas, producer gas, blue gas, and carburetted water gas as separate items, yet almost never were all these gases measured separately. The manner in which the total quantity of gas made was divided between these categories often depended upon long-established custom. Other figures that had to be considered were the therm yield of gas per ton of coal carbonized; the measurement of hydrocarbon therm yield involving the Hydrocarbon Enrichment Value (H.E.V.); the thermal balance of coal usage; the establishment of standards to which performance results could be referred; the establishment and maintenance of standards of quality; and the control of the quality of coke made for sale. He also spoke of recruitment and training as being essential considerations in the organization.

A great part of the departmental organization described in the paper would be necessary to maintain even reasonable standards of operational efficiency, but one of the major purposes of creating the somewhat larger organization to cover all technical aspects of the Board's work was to ensure technical progress and not merely static efficiency. As some examples of the kind of technical progress that had been considered, Mr. Davis briefly describes progress that has been achieved in heat services in multi-storey dwellings; in oil gasification; and in gas quality. He said that the three examples were quoted not so much for their intrinsic merit as to show the kind of task which could be undertaken by a technical organization which was not separate from the sphere of operations, but was sufficiently free to think independently yet act in unison. There were big opportunities ahead for the industry, and in adapting methods to new circumstances, Area technical services were playing an indispensable part.

DISCUSSION

Dr. Arthur Marsden, M.B.E. (Area Scientist, South Western Gas Board), in opening this discussion, said that the author had made a particularly good point in the second paragraph on page 14, when dealing with the thermal yield of gas per ton of coal carbonized. One so frequently heard people quoting figures which were not comparable because the straight coal gas yield had been augmented by variable amounts of blue water gas therms, produced by 'steaming.' One could make a similar protest concerning coke yields, which were often not calculated back either to the dry basis or to an agreed standard moisture content. In connection with the figure on page 17 for nitrogenous gas, where the limit was placed at 50 grains per mill. cu.ft., Dr. Marsden thought that figure was too high, and from his own experience would have preferred 30 grains, especially in view of the continuing development of modern appliances. He said that although the paper was stated to be a description of the provision made by the South Eastern Gas Board for rendering technical services in general, its contents were of wide application and, apart from the general procedures at present adopted by most, he was sure that a careful study of it would be time well spent.

Mr. David Elgin (Technical Officer, Scottish Gas Board) said that the form of an Area technical service would depend on its responsibility as determined by the Board operating it and its relationship with the remainder of the administrative

structure. Of the seven sub-divisions mentioned by the author, three of them being chemical and four being physical, the one referring to works processes and that referring to instrumentation were regarded by all as being fundamental. Once a gasworks grew, these two aspects followed almost automatically and built themselves up as they were required, and that determined the form of the organization at works level. He asked if the Chief Technical Officer was given a free hand financially, perhaps within the annual budget originally suggested, or was a fixed sum devoted to the technical service annually, with latitude for special work. How was the expenditure treated? Was it costed entirely to the service as an Area expense, or was it passed on to the operational units, and, if so, with what degree of care?

Mr. R. M. Farror (Assistant Chief Engineer, South Eastern Gas Board) said that the paper was of particular interest, in that it indicated not only the extent to which it had been possible to provide a specialist technical service in the South Eastern Gas Board but also how the work of the scientist, be he chemist of physicist, was co-ordinated with the work of the resident technical staff throughout the Area. He pointed out that prior to nationalisation the technical staffs of each undertaking had had to rely almost entirely on their own ability and experience, and it would be understandable if these same engineers had perhaps at first shown some hesitation in seeking the specialist assistance which more recently had become available. The author had not mentioned the use of conferences at works or Divisional level, but in concluding his comments, Mr. Farror drew attention to the value of regular meetings for bringing together members of the chemical and engineering staffs. Frequent meetings at which all technical matters concerning production and distribution were discussed could be of great assistance in welding together the various members of the technical staff into an efficient and enthusiastic working team.

Mr. K. W. Francombe (Whessoe, Ltd.) commented on section VII, which had dealt with the recruitment of staff for the types of job which the author had described. He said that everywhere people were wanting and advertising for university graduates with the best possible qualifications and the best possible brains for recruitment to their staffs, but that they were quite unsuccessful in obtaining enough of these high-level people. He had found that a very good source of people for jobs at that level were failed-degree men who were usually excellent men but lacked the aptitude for passing the second or third-year examinations.

Mr. E. T. Pickering (Chief Chemist, West Midlands Gas Board) also mentioned recruitment of staff, but he was not happy about the state of the industry unless it was in a position to recruit first-class university graduates.

At the other end of the scale care must be taken not to get in and train too many grammar-school boys, just as more graduates than were necessary must not be recruited. In the past too many good people had been engaged day in and day out on routine work which could just as well have been carried out by secondary-school boys; but there again it was essential that they should have a proper training and be required to take some examination, possibly the City and Guilds. He thought that with the vast amount of capital in our industry and the materials which had to be handled, on the practical side there was just as much need for great capability of mind as there was on the research side.

Mr. L. T. Minchin (Consultant) said that one had become used to thinking that the calorific value must stay in as straight a line as possible, but the consumer had to be pleased rather than the works calorimeter, and Mr. Davis and himself had pointed out for many years that it was much better to let the calorific value vary if that would make it possible to keep the Wobbe Index almost constant. That was still not the general practice, but it would be of enormous help not merely to domestic but even more to industrial users of gas. To make a neutral atmosphere in the furnace with a gas having a widely varying Wobbe Index was almost impossible.

Mr. H. F. H. Jones (Vice-President) asked that there should not be too much distinction between the man who was described on page 3 of the paper as 'the man responsible for day-to-day operation' who 'necesarily works at high pressure to keep the machine running on the accustomed lines' and the Chief Technical Officer's staff, who might not have day-to-day responsibilities but who had special responsibilities and who were 'idle men,' inasmuch as they had time to think, or at any rate they should have time to think. He felt that whatever position of responsibility a technical man held, whether operational or otherwise, he must train himself to find time to think. He should do that no matter what his job might be. He said that in a large organization the man who was going to succeed was the man who was prepared to assemble the facts and relate them to any problem before him, whether management, scientific, or of any other kind. When he had brought all his facts together he would often find that the problem had solved itself; but if he started having wild hunches before he had got his facts together he would sometimes be right and sometimes wrong, and his Area Board was more likely to remember the occasions on which he was wrong than those on which he was right.

Mr. J. Carr (Deputy Chairman, South Western Gas Board), on the question of training, said he believed that at a very early stage in a boy's training he should be educated in what things cost. The first bill was coal, but the second was wages, and unless it was instilled into young men coming into the industry and they were allowed to grow up with a knowledge of what things cost, later on, when they occupied positions of responsibility, if that side of their education had been neglected the industry would suffer for it.

Author's Reply

Mr. J. E. Davis, replying to the discussion, said that very definitely he had been dealing with one Board which he knew well and the needs of which he had been trying to meet. He would not like to say that what was applicable there was necessarily applicable anywhere else. He thought that some sort of organization is necessary. It might well be that in some other Boards the strength of the Divisional organization would need to be greater, because some Boards had their whole structure on a Divisional basis, and too much weight at Area level would upset that; but he felt that there was need for some centre, in order that information might flow all through the Area and not be arrested. He said that he was not given a free hand to spend money. He had, like every other responsible officer, to prepare and justify budgets and argue about them, but there was a real measure of responsability. Training in costs was essential and must go along with every job as far as possible. He found, however, that there was a tendency for the chemist to work out the economics of a process even before he was sure that the reactions would go.

He had been intrigued by his idea of introducing into this country a well-established Indian practice. He did not mean to say that the gas industry did not need first-class graduates, but how many could it get at the present time? When the whole nation was so short of scientific man-power it would be very wrong to recruit first-class men for routine jobs. If any Area Board could get one or two first-class men a year it would be doing very well indeed, and that was certainly as many as it could expect to hold. On the other hand, so far as works technical staff were concerned, a Board might desire to recruit six or eight a year. With regard to schoolboys, it had been one of his great objectives to do away with the 'dead-end kid,' the schoolboy who came in at the age of 16 and was given odd jobs to do, and at 35 nobody quite knew what to do with him. That was wicked, and was one reason why the industry said that if it took them in at 16 it would give them a good chance to become professional men. Not all of them would, of course.

GAS ABSORPTION

Further work on the subject of gas absorption is described in the report for 1954-55 (H.M.S.O. 1s. 6d.) of the Department of the Government Chemist. Studies of the process, it is stated, usually fall into two classes, (1) advances in the fundamental theories of mass transfer, and fluid friction, relating to experimental conditions which are, or are assumed to be, regular and relatively simple, and (2) experimental investigations of the performance of various types of absorber. A third method sometimes found useful consists of separate studies of the various steps in the absorption process.

Tolerance of Aerated-burner Appliances

A Summary of the ppper to the AUTUMN RESEARCH MEETING of the INSTITUTION OF GAS ENGINEERS by Mr. G. H. Fuidge, Chief Physicist, South Eastern Gas Board, and a report of the discussion.

MR. G. H. FUIDGE, Chief Physicist, South Eastern Gas Board, in presenting the paper, said that it was mainly the work of Dr. Dewhurst and that he could not claim to have done more than collaborate with him in the general planning of the work and in outlining the paper. He said that in 1939, with Dr. Dewhurst, he had presented a paper to the Institution of Gas Engineers on the 'Combustion Characteristics of Town Gas' in which was indicated the usefulness of the combustion diagram. In a further paper, in 1943, the earlier work was elaborated to include diagrams for a number of commercial burners and a variety of gases. They hoped that the present paper might be considered to complete this work. It gave diagrams for burners operating in their appliances rather than for isolated burners, and this had made it possible to include in the diagram the limits of air/gas ratio for incomplete combustion.

For the benefit of those who had not had time to study the paper in detail, Mr. Fuidge thought it useful to draw attention to some of the interesting features of a few of the diagrams. In diagram 3 the aeration curve was situated above the bottom of the back-fire zone. This meant that if the tap of this burner was turned down quickly, back-fire resulted. The rather remarkable effect which the control tap could have on the aeration curve was shown in several of the diagrams, and notably Nos. 8, 9 and 10. The increased turbulence caused by partial closure of the taps on this appliance caused the degree of aeration to increase, so that the aeration curve rose as the input was reduced. Diagrams 10 and 11 showed also the increase in aeration which occurred at very low gas rates as a result of buoyancy effect, a phenomenon which plays a part in producing noisy extinction. On the other hand, diagram 22 showed that the aeration curve for an inverted lighting burner dropped very sharply at low gas rates. In this case buoyancy tended to reduce the aeration, but there appeared to be a further effect; because of the high temperature of the burner, the viscosity of the gas was sufficiently high to ensure streamline flow at all but high rates. In consequence, the entrainment of air was inefficient and the aeration fell suddenly when the gas rate was reduced below the critical value for turbulence.

Diagrams 4 and 5 showed the very marked difference in the shape of the zones of incomplete combustion given by spreading flame burners and ring burners; the explanation was to be found in the greater tendency for flame impingement with the latter. Finally, in diagram 21, for the columnar-radiant gas fire, a curve R-R had been drawn representing the conditions giving maximum radiant efficiency. It was interesting and probably significant that this curve was very close indeed to the curve for the incidence of incomplete combustion.

Leaving the details of the diagrams, Mr. Fuidge and Dr. Dewhurst considered the unruled portions of the diagrams to represent the areas of usability, since they were bounded by the limits beyond which combustion became unsatisfactory. They realized, however, that their earlier system of assessing the tolerance of the burner by this area of usability was not fully satisfactory, and in the present paper they expressed the tolerance of the appliance in a way which they thought more useful, namely, the range of Wobbe number over which combustion was entirely satisfactory according to the criteria which they laid down. Since the gas grouping was also based on Wobbe number, each group having a range of about 60 units, they were able to say that an appliance had a tolerance of two, three or four gas groups. It could be observed from table 7 in the paper that they had found that most hotplate burners had a tolerance of at least two groups, and for many the number was appreciably greater. At first sight this seemed to be more than adequate. As shown in section III, however, it appeared that it was difficult for production engineers to do more than maintain the mean characteristics of the distributed gas within the range of Wobbe numbers of any one group, and that, for example, the hour-to-hour variations for G4 gas might cover a range of more than three gas groups. While they felt that every attempt should be made to reduce these variations, it was clear that it was essential for the tolerance of appliances to be as wide as possible.

In section IX of the paper some deductions were made with regard to the design features of the burner and surrounding appliance which affect its tolerance to changes in gas characteristics. The essentials appeared to be that the total area of flame port should be large, and the flame ports themselves should be narrow and deep. There had to be adequate space for secondary air and for the escape of products, and suitable aeration control should be provided. The actual dimensions mentioned in the paper were only suggestions and not put forward as hard and fast limits. The authors hoped that appliance makers would find the combustion diagram technique a useful technique and a useful means of ensuring that the new burners which they designed had the requisite tolerance.

Mr. Fuidge felt that he should mention the true criteria of combustion characteristics, the Wobbe number and the aeration number. For traditional types of town gas these two criteria followed each other fairly closely, but by tests with more unusual gases they had been able to make some assessment of their relative significance. Their results were shown in Fig. 7 of the paper. The relationship between Wobbe number and gas pressure for the incidence of incomplete combustion was very good for all four burners, while there was little or no relationship in the case of the aeration number. By contrast, the tendency for a burner to back-fire on quick turn-out was clearly related to the aeration number and not to the Wobbe number.

Concluding, Mr. Fuidge said that it was only when new methods of gas production were being considered, and when the characteristics of the gas departed markedly from those of the traditional gases, that both criteria became important. When these non-traditional gases were in question, Delbourg's diagram could be most helpful, and was perhaps a somewhat better indication of the probable performance of gas in this country than the more complex indices proposed by Wheeler. The authors suggested, however, that the calculated limits were no more than a guide, and that the construction of combustion diagrams for a few selected representative appliances provided a method of obtaining confirmation of interchangeability.

DISCUSSION

Dr. W. A. Simmonds (Midlands Research Station, Gas Council), opening the discussion said that at the stage at which gas was burnt the effects of gas quality could be critical, because changing the composition of the gas could result in the flame becoming unstable, or in combustion being incomplete. Thus, dangerous conditions could arise either from the flame being extinguished or from an increase in carbon monoxide concentration. That was the stage with which the paper was concerned. The paper dealt with the combustion performance of a variety of gases on complete appliances. That was of considerable importance, because the interaction of the various parts of an appliance could often mean that information obtained about one part in isolation had little bearing on the performance of that part in the complete appliance. Furthermore, a really effective appliance could be developed only by treating the whole as a unit, and it was therefore essential to acquire the habit of thinking in terms of complete appliances. He said that the use of a line that had been added to the combustion diagram to define the zone of incomplete combustion, fully justified its inclusion. Another important contribution was the use of a single figure to assess the tolerance of an appliance. An essential condition for any such assessment to be widely used was that it must be simple, and it was obviously convenient if this could be given as a single figure. In interpreting the results given in the paper, it should be noted that the authors had been concerned that the flames should be stable

and safe, and they had not, and could not, concern themselves with the effectiveness of the appliance. In the field of industrial appliances little attention had been given to the measurement of their tolerances. Conditions were somewhat different from those of the domestic field, for the appliances were much less standardized, and also the object of a heating process was often much more closely defined. Dr. Simmonds said that as it was now possible to assess appliance tolerances, a start could be made on the determination of the range of variation of gas quality that was allowable, and therefore it was known within what range control of gas quality could be attempted. In conclusion he stressed once more the importance of the problems caused by variations in gas quality.

Mr. A. R. Bennett (Research Manager, Radiation, Ltd.) said: 'While different appliances may vary widely in sensitivity to changes in gas characteristics, almost every step which we can take to increase tolerance either tends to lower efficiency or involves a sacrifice of performance in some other direction, such as cross-lighting on multi-port burners. This latter effect depends on a different set of gas and burner characteristics from those involved in the maintenance of satisfactory combustion when the flames are alight, and it is often difficult to reconcile the two requirements in a single burner.' He felt that it was not sufficiently widely realized that a gas supply of widely variable quality was by its very nature an inefficient gas supply, because the margins which had to be allowed on burners and combustion spaces to cater for the fluctuations inevitably reacted on tolerance and efficiency. He said that quite striking changes in efficiency and in flame stability on turn-down and in combustion characteristics generally may lie in a few thousandths of an inch of port space size or depth or a few degrees of port inclination.

Mr. W. E. Benton (Technical Director, Sidney Flavel & Co., Ltd.), said that there was a quicker method of determining aeration with reasonable accuracy, which consisted simply in measuring the burner pressure. If a certain rate of air was driven through a burner and the pressure in the burner was measured, and the same rate of gas was put through an injector, using the burner in the normal way, and the burner pressure was again measured, the aeration was, to a close approximation, the square root of the ratio of those two pressures minus a small quantity which depended on the density. There was a temperature effect, but that could be eliminated by heating the burner when making the calibration curve.

Mr. G. W. Culshaw (Research Chemist, Stoves, Ltd.) mentioned Section VIII in which the authors had stated that there was a close relationship between incomplete combustion and Wobbe number, and none between the CO/CO_2 ratio and aeration number; hence they had recommended that for the combustion testing as laid down in B.S. 717 and B.S. 1250 it would be better to test at a high Wobbe number—they had suggested 800—rather than at a high aeration number, as was laid down at present. He pointed out that testing at a high aeration number was originally suggested by the authors' friends on the opposite side of the Thames at Watson House. They had suggested the procedure, no doubt, after very considerable thought and testing and experience. To make the confusion even worse, the authors themselves had suggested in Section IX(B) that the position of the limiting curve for incomplete combustion appeared to be almost independent of both Wobbe number and aeration number.

Mr. John Foxton (Senior Chemist, Cheltenham Division, South Western Board) said that the introduction of new methods for the manufacture of gas must be considered in the light of the information given by the authors. The maintenance of present-day standards of performance of appliances became more difficult when mixing of gases of widely varying characteristics was practised. Many of the gases now being considered had properties very different from the normal town gas, for example, high calorific value oil gas and low quality gas from the complete gasification of coal. He added that he would welcome the views of the authors on this point.

Authors' reply

Dr. J. R. Dewhurst (Senior Physical Chemist, South Eastern Gas Board) replied to the discussion and said that he welcomed the opportunity to say how much Mr. Fuidge and he appreciated the interest which their paper had aroused. He couldn't deal then with the points which had been raised, but he wished to agree with Dr. Simmonds that there was a very definite need for information about non-aerated burners and industrial burners, though he thought that the industrial burner was as a rule rather different from the domestic one in that normally it could be adjusted. They had come up against problems where they had had to install apparatus for doing the adjustment for the operator, and very considerable success had been obtained using a Wobbe number recorder. That was possibly an answer to Mr. Foxton's question.

Mr. Benton mentioned the inertia effect on turning down a gas burner. Dr. Dewhurst said that he was afraid that that was a point which he had overlooked, and he would have to investigate it. He did not know why he had overlooked it, because it was a favourite theme of his that gases behave in the same way as liquids, and most people were well aware of the inertia effect of liquids flowing along pipes. He did not altogether follow Mr. Culshaw's contribution and preferred to wait until he saw it in writing, but he had the impression that the figures which he quoted supported Mr. Fuidge and himself, in that when the Wobbe number was low there was good combustion, and that bad combustion took place only when the Wobbe number was high.

GASWORKS EFFLUENTS—From p. 650.

however, that their work would support the view that the percolating filter would prove more reliable, especially in thiocyanate removal, and more economic than the deep aeration tank. It had been shown the percolating filters could deal with gasworks liquors of about 7,000 O/A at a capacity of 100 gal. per day per cu.yd. of medium with an efficiency of about 90%, removing both phenols and thiocyanates effectively and remaining active without change of medium for six years. The economics of the two systems should be compared.

Dr. W. H. Blackburn (Leeds University) remarked that many sewage works managers believed that gas liquor was the main source of their difficulties. Some had a different opinion, but it was important to realize that the treatment of gas liquor by bacterial oxidation, without any dilution with sewage, was a very much more difficult matter than that of normal sewage. But that was what the author has been describing in this paper. Moreover, he has chosen for his experiments the most difficult of liquors, those from vertical retorts—very much more difficult to treat than that which comes from horizontal retorts or coke ovens.

Dr. Blackburn addressed himself to a number of details. He had been investigating the treated effluent which still had an O/A of 300 to 400 p.p.m. and which was consequently not suitable for discharge into a river without further treatment. It appeared probable that some of the substances which were difficult to remove by bacterial oxidation were the result of reactions between the phenolic compounds present in the original liquor. If these were not removed before the bacterial oxidation stage, the final effluent had a lower oxygen absorption value.

Mr. Badger replied to the questions of detail raised by several speakers and concluded, 'Percolating filters may well be used for thiocyanate since the oxygen demand is not nearly so great as with the phenols.'

SOURCE OF DANGER

In the 15th Report of the European Productive Agency an article entitled 'Not as Dead as You May Be' follows with the exhortation: 'Watch out for pipes and cables.' In a great many older firms, says the article, there are pipes which once formed part of the gas, water, steam, or heat supply, and lengths of electrical wiring which are not now in use. The machines they served had been moved or for some other reason had become redundant. As a rule they were merely blanked off and forgotten. 'However,' continues the articles, 'the pipes are often still subject to pressure, and, if they are water or steam pipes, to corrosion as well. As often as not, electrical current is still present in the old wiring, and if it is bumped or rubbed a short circuit may be the result. These old installations are a permanent source of danger.'

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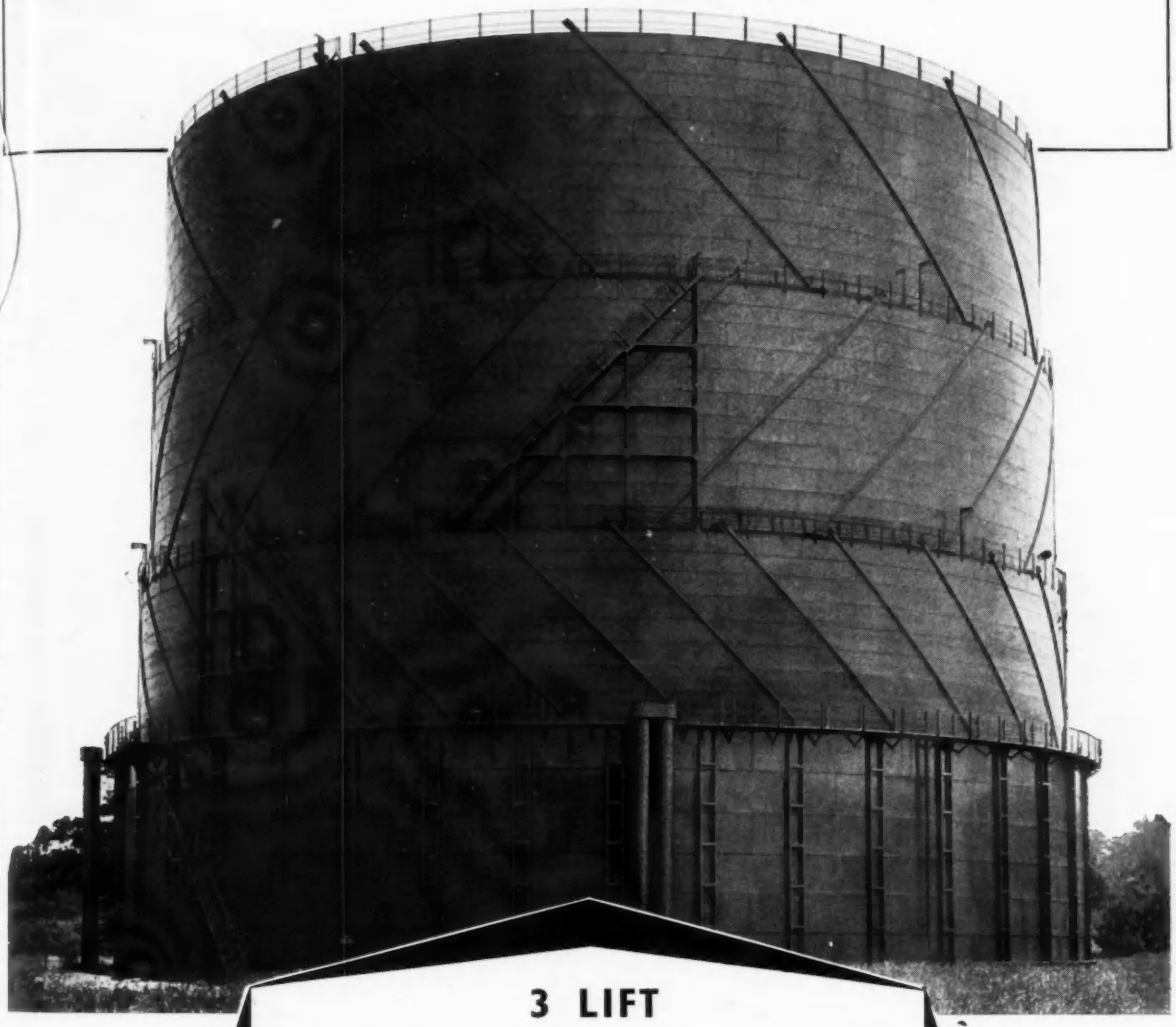

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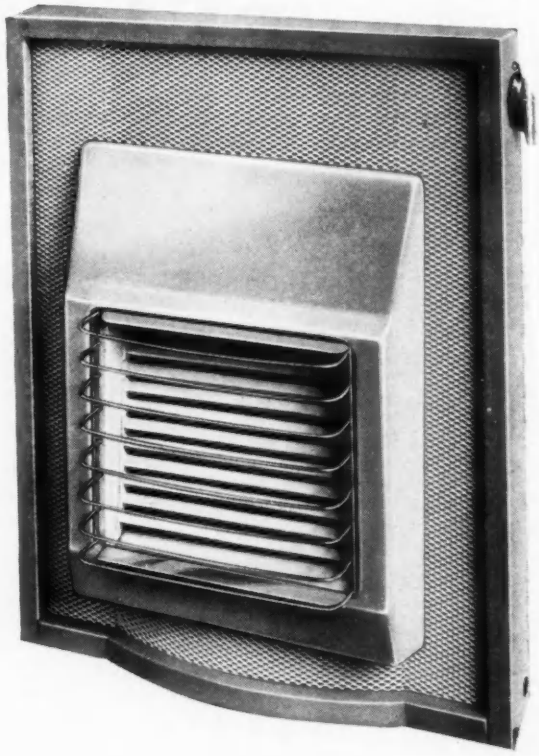

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Coke Ovens as Gas-manufacturing Plant

Discussion and the authors' written reply on the paper by G. Dougill and A. C. Nelson published on p. 515 of the 'JOURNAL' of November 23.

Mr. G. A. Hunter, Stewarts & Lloyds, Ltd., said a base load gas plant was just as essential in some industrial plants as for the varying demand facing the gas industry—so the steel industry was on common ground when it thought of coke ovens as gas manufacturing plant, even though their primary and more profitable function was the regular and continuous supply of metallurgical coke. Full marks should be given to the authors for their work on tar storage tanks, the cleaning of which was described in the paper as an expensive and filthy operation. Under present-day conditions of generous choice of jobs, it was no wonder that they found it difficult to collect willing workers for that sort of task. The Russell Screen technique could be used to avoid most of that operation, but he also believed that they could help themselves even more if they 'let up' a little on the custom of fine crushing. Much of the tar storage tank deposit joined the gas stream via the steam ejectors used during charging periods, and once in the stream it became the operator's headache right through the recovery plant. On the life of a battery, Mr. Hunter said that if one was obliged to rebuild on the foundations of existing ovens, a fearful amount of potential coking capacity was wasted by the destruction of ovens before they were worn out.

Mr. C. Stott, Deputy Chief Engineer, South Eastern Gas Board, said that after the war the former South Metropolitan Gas Company was faced with the need to renew carbonizing plant on the major scale. Their largest works at East Greenwich had a rated output of 36 mill. cu.ft. per day produced by the carbonization, in horizontal retorts, of 2,700 tons of coal per day. The ready access to sea-borne coal, the extensive site available and the convenient proximity of the tar and chemical products works made it an ideal station for the bulk carbonization of coal, and it was decided to install coke oven plant in the scheme of major renewal. The advantages expected were low cost of process labour and maintenance, and long life.

East Greenwich Development

The capital cost of carbonizing plant demanded that this form of plant should be used exclusively for base load purposes and the reduction after vesting date of the declared calorific value to 500 B.Th.U. per cu.ft. with a range of Wobbe Index 701-760 and S.G. limits 0.43-0.51 meant that the seasonal diversity of load in South London could be met by using carbonizing plant at full load throughout the year, in conjunction with gasification plant to accommodate the variation in demand. On this basis the East Greenwich development represented a closely integrated installation of modern plant comprising, as base load, 88 coke ovens in four batteries producing 24 mill. cu.ft. per day at 550 B.Th.U. (stripped) from 2,000 tons of coal per day, and for the variable load, 25½ mill. cu.ft. per day of C.W.G. plant in eight sets. With these were the associated ancillaries, wet purification plant, oxide purification plant, power house, water tube boiler plant and river water pumping scheme. The whole of the manufacturing plant was capable of 10% overload at peak periods. Coke ovens made possible the independent planning of the steam and power system. The sensible heat of the outgoing waste gases was returned to the combustion flues, thus leaving the steam raising to be considered as a separate problem, giving complete freedom of choice in the type of boiler, the number of units, the fuel to be used and the most advantageous pressure at which the steam was raised.

The adoption of manufacturing methods on the major scale involved still closer attention to the continuity aspect and many details of design were closely considered in order to ensure the utmost regularity in the charging schedule. Continuity had been substantially achieved in that charges missed did not exceed 0.3% of the total work.

The first two batteries had gone to work in September, 1950, the third battery in September, 1953, and the fourth in October, 1955. This was a fully economic installation, handling 2,000 tons of coal per day, with a common coal handling, storage and reclaiming plant and a common coke handling and treatment system. As in the case described in the paper, the coals supplied from the North East coast were carefully examined for swelling effects by the oven builders, and it was found that the range of coals traditionally supplied were within the safety limits providing that segregation was avoided and the bulk density of the coal was limited by suitable size reduction. The Koppers test was found to be a useful guide and for safety it might be taken that on this test there should be no expansion and at least 8% final contraction. The coal was crushed to 2 in. in primary crushers and was further reduced to ¼ in. in Flextooth hammer mills. Six blending bunkers, each of 1,200 tons capacity were provided but to date had been used only for segregating unduly wet coals or more rarely for the more heavily swelling coals. Mr. Stott went on to give a comprehensive description of the ovens.

Mr. F. K. Illingworth, National Coal Board, said that naphthalene removal before ammonia scrubbing was an absolutely correct sequence.

Mr. H. Johnston, North Eastern Gas Board, said for the gas engineer the main interest would probably be an examination of performance and costs and, in the light of their own peculiar conditions, consideration of coke ovens for gasworks plant as opposed to the generally accepted coal gas manufacturing plant. With regard to the re-build programme, the generally accepted average life of silica coke ovens of the Beckton size was about 100,000 tons, when employing flue temperatures not exceeding 1,400°C. and carbonizing coals of normal coking quality. The quoted life of the second original battery was already 150,000 tons per oven and not yet finished. Considering that the ovens were used with a potentially dangerous coal, it was a remarkable life, and spoke much for the care and attention given to design, erection and operation of the plant. The first battery had enjoyed a normal expectation of 100,000 tons per oven. Was there an explanation for the difference in life of the two batteries?

Mr. Johnston said he was also interested in the problem of regenerator blockage by the deposition of salts, ash and pitch, and the method of investigation and the solution. Did the authors consider that trouble with deposits of salts, ash and pitch in the regenerators might have been due to using small coke, plus breeze, with a higher volatile matter content than large coke? At the ovens he was associated with trouble was occasioned with tar deposits at the seals and Thyssen cleaners—which never got through to the regenerators and this was when using small coke in the producers. When using 1½ in. × ¾ in. graded coke no trouble was experienced.

Bulk Density of Coal

The author had discussed the dangers of using highly swelling coals on the walls of ovens, particularly as to the internal pressure developed, with the possibility of bursting off oven doors and damage to the silica walls. It was concluded that the problem arising when using Durham coal appeared to be solved provided that the bulk density of the coal was kept low. The correctness of the conclusion and the measures taken by the Beckton engineers and the builders of the plant spoke much for the courage of these who made the decisions at the time. He believed it was now generally accepted in coke oven practice that low bulk density of the oven charge increased the safety of the coal, and that reasonably slow coking and moderately low ovens were desirable.

Mr. F. S. Townend, Woodall-Duckham Construction Co. Ltd., said that as the paper would be referred to frequently, he would make a few remarks with a view to clarification. The original two Beckton coke oven batteries were built in 1931 by the Koppers Company of Sheffield to the designs of the parent company, H. Koppers, G.m.b.H. of Essen. When the Woodall-Duckham Company acquired the business of Koppers, Sheffield, in 1940 these batteries had already given nine years of service. They were the only coke oven batteries at Beckton thoughout the war years. Since the end of the war his Company had been entrusted with the construction at Beckton of three additional batteries and the reconstruction of the two original batteries. The reconstruction of the second of these batteries was to be commenced next year, when it would have

been at work for approximately 25 years. It was a tribute to the structural stability and technical adequacy of the original design that, in spite of the arduous conditions under which the plant was operated during the war when the whole of the charging operations were confined to the daylight hours, no fundamental changes in design were deemed to be necessary for the new and reconstructed batteries.

Today, the doubts regarding the possibility of trouble when carbonizing Durham gas coals in coke ovens would not arise. Quite apart from the practical experience of coking mixtures of Durham gas and coking coals at Beckton and elsewhere, the classic investigation into the coking pressures of British coals which had been carried out by the British Coke Research Association using the movable wall test oven had shown that broadly, no difficulties need be feared with coals having a volatile content on the dry-ash-free basis of above 25%. The volatile contents of present-day Durham gas and coking coals were well above this limit.

The Beckton battery was unusual in that to each oven there were two gas offtakes associated with three charging holes. The authors had justified the use of two offtakes on the score of regulation of the gas pressure in the ovens. Today two offtakes were advocated for smokeless charging.

Turning to the question of blockage of the regenerators, he would not like it to be thought that the Beckton experiences were anything but peculiar to Beckton. It might be taken that they arose entirely from the former use of salty water for coke quenching. Normally, it was not difficult to cool and clean producer gas made in coke-fired mechanical producers to a degree that avoided serious deposits of dust in the regenerators. It was a more difficult problem to reduce the tar content. Generally speaking adequate spray cooling was sufficient to keep both the dust and tar contents to a reasonable figure. He wondered whether the combination of electro-detarrers and tar oil vaporizer adopted at Beckton was dictated by the use of coke and breeze in the producers which might have come from other types of carbonizing plant.

Limitations of Coke Ovens

Experience at Beckton had clearly indicated that coke ovens provided a well-established and most reliable means of bulk carbonization of coal, but certain limitations must be recognized. The ground space required by a coke oven plant was considerable, and as far as amenities were concerned it could not be considered as yet reaching the standards which were most likely to be demanded in the future. Moreover, a hard coke was produced the future market for which (outside the metallurgical field) was a matter for careful assessment. In this connection he was interested to see that in Table 4 of the paper the value taken for coke-oven coke was 1s. 3d. per ton higher than that of continuous vertical coke. In view of the freer-burning properties of the latter and the potential future increased demand for smokeless fuel for the domestic grate, did the authors consider that these relative coke values were representative? It was further to be noted that the high calorific value of coke oven gas required the regular provision of a considerable proportion of expensive blue water gas as diluent. Was not this likely to prove an embarrassment in the future unless an alternative means of producing the diluent, say from complete gasification plants using coal, was adopted? The ideas on which the future development of the Beckton station were being based were of peculiar interest. The proposal to embody a liquid purification stage before the final oxide plant was a recent departure in British gasworks practice. The results which would be forthcoming on the hot vacuum carbonate plant which was being built at Beckton to the designs of the Koppers Company of Pittsburgh would be keenly awaited. Apparently, the choice of the gasmaking system had not yet been made, but it was interesting to observe that among the various fascinating alternatives consideration was still being given to the well-tried but less romantic process of carbonization.

Mr. F. G. Pyper, East Midlands Gas Board, said he had once been closely associated with the coke oven plant at Beckton, and so far as he remembered, the first battery was designed for a coal shrinkage of about 4 in. In fact the shrinkage was much greater than this and, with some coals, was as much as 24 in. They believed then that the free space in an oven, primarily intended for gas manufacture, should be hotter than for normal coke oven practice, to ensure the maximum yield of gas even at the risk of a little roof carbon and naphthalene. He would be interested to know what was done regarding the relative heights of the coal charge and flue top in the design of the subsequent batteries.

The problem of sponge coke was only partially solved by the admixture of a proportion of coking coal. Mr. Pyper said he never felt very happy about this solution, particularly as the gas yield was noticeably reduced. They did some very successful batch experiments on blending breeze with the Durham gas coal. The sponge was eliminated and the quality of the coke made was excellent. He tried it himself both in an open fire and in a small domestic boiler, and it was superior to anything he had used either before or since. They felt too that in operation the coking time would be reduced so that there would be at least no loss of coal throughput and that the therms per ton of coal in the blend would almost certainly be equal, if not greater than that yielded by gas coal alone. A breeze mill was accordingly installed, but, they were ill-advised on the best type to use and, at least in his time, no breeze blending on a commercial scale was ever carried out. Had this method ever been reconsidered?

Mr. Hunter proposed a vote of thanks to the authors, and **Mr. G. E. Currier,** O.B.E., Deputy Chairman, North Eastern Gas Board, seconded.

Authors' Reply

The Authors, in a written reply, stated that they were in agreement with Mr. Hunter's objections to charging the ovens with finely ground coal but considered that screening of the tar immediately after the decanters was desirable, even when charging less finely ground coal, if deposition of solids throughout the system was to be avoided. It was considered necessary at Beckton to charge finely ground coal in order to maintain low bulk density, and this practice was rigidly adhered to for many years. They now realized that Durham coals were safe at much higher bulk densities and they were charging the ovens with a much less finely ground coal. The percentage through a ¼ in. screen averaged 40%-45%, compared with the 80% previously attained. There had been little, if any, deterioration in coke quality as shown by the Shatter Test. The increase in bulk density had resulted in an increase in charge weight of some 20-25 cwt. per oven, and the maximum throughput of the plant was maintained with considerably less oven operations.

Mention had been made by Mr. Stott and Mr. Pyper of the relative heights of the hairpin flue and of the coal charge. In the four operating batteries the hairpin flue was level with the coal charge. This was done to produce a higher oven top temperature than was normal in coke oven practice in order to give maximum gas yield. The control of this temperature, however, was extremely critical, and over-cracking conditions with degradation of the gas, and excessive formation of carbon, could easily be produced. In the battery under construction the top of the hairpin flue had been lowered by 5 in.

The authors agreed with Mr. Illingworth that it was advantageous to increase the bulk density of the coal. Experiments in adding oil to the coal were made, and they found little advantage unless the coal was finely ground,, 80% of the product passing through ¼ in.; and in addition they had labour troubles on account of the smell.

They were of the opinion that a secondary detarrer was necessary for the removal of oil fog before ammonia washing. Apart from the advantage of preventing fouling of the brushes in the rotary washers, they deprecated the practice of allowing benzolized gas oil to accumulate even for short periods in ammoniacal liquor tanks. It had been suggested that the use of the oil vaporizer at the inlet of the producer gas detarrers was necessary because of the use of coke and breeze with a somewhat higher volatile content. They did not agree that this was so. It was the nature of the deposit, tar, sodium chloride and fliers, and not the quantity, that necessitated a small addition of oil to produce fluidity. Mr. Stott appeared to achieve the same effect by working a higher outlet scrubber temperature and relying on aqueous cooling in the detarrers.

Governing on the coke oven batteries and exhausters was now practically trouble-free. All batteries, with the exception of No. 1, were equipped with Askania governors, and these were very satisfactory.

Clean Air—A Challenge*

By C. A. DEAS, M.Inst.Gas E., M.Inst.F.†

Is the gas industry prepared to accept the challenge of providing solid smokeless fuel in quantities sufficient to meet all the needs of the smokeless zones visualized in the Clean Air Bill? The Beaver Committee recommend: 'Increased coke production at gasworks must be the main source of increased coke supply; coking coals and gas coals can be blended satisfactorily with considerable amounts of non-coking coals for the manufacture of coke, and the gas industry could extend the range of coals carbonized.'

Recent changes in coke prices have served to reduce the use of water gas plant to its proper rôle of a producer of peak load gas and as a means of assisting in the control of the coke market. This reduction in the use of water gas plant, together with the installation of oil gas plants, should release more coke for sale. The installation of oil gasification plant for the production of base load gas does not, however, appear to fit in with the demand for larger quantities of solid smokeless fuel.

It is significant that the report of the Gas Council for the year ended March 31, 1955, refers to a number of projects for the installation of oil gasification plant and estimates that the 21 plants at work or on order will save 364,00 tons of coal a year. These projects, as a forerunner of others, seem to indicate that less coke will be available for sale other than in those cases where oil gas will replace carburetted water gas. It does seem, therefore, that if the requirements of the Beaver Committee are to be met, a completely new conception of the place of coke in the gas industry's activities is essential. And in the future every effort should be made to deliver the maximum quantity of the coke produced from each ton of coal carbonized.

Mr. Evetts, in his address to this Section at the annual meeting in September last, commented on use of coke on the works. He drew attention to the substantial increase in coke available for sale which would follow the substitution of breeze for heating carbonizing plants; the equipping of continuous vertical installations with recuperators he also thought worth further consideration. I would like to add to these suggestions the urgent need to reduce the figure of '1 lb. of coke per 100 lb. coal' used in producers, if possible to the condition when so called 'waste heat' steam production is nil. The use of low volatile non-coking coals as an alternative fuel for both producers and water gas generators is a further possible method of increasing coke availability. Rich gas firing of carbonizing plant at times when the full gas output is not required is a further potential means of making more coke available from existing plant, and there is, of course, the Rochdale process of accelerated carbonization.

For heating retorts and the production of water gas, the use of substantial tonnages of some of the best coke produced seems quite unrealistic in view of the acknowledged reducing availability of good coking coals and the need for increased tonnage of coke. More attention is often given to the coke required for C.W.G. use than that for sale.

Those of us who are directly concerned with the marketing of coke would do well to remember that, in general, if more coke is to be made available, more gas must be sold, and if more gas is to be sold, then its price must be competitive with electricity and oil.

If, therefore, the trend of increasing oil gasification is to be reversed then, on today's coal and oil prices, the price of coke in the South needs to be increased by about 20s. per ton. Alternatively, coal must be made available to the industry at a price that will enable it economically to fulfill its proper rôle of processing raw coal, using the minimum quantities of oil for peak load gas only. The problem of making available increasing quantities of coke to meet the needs of the Clean Air Bill is clearly not simply a matter of making more coal available for carbonization.

The Beaver Committee visualize the replacement of coke, at present used for commercial purposes and large scale central heating installations, by oil, as likely to be the greatest source of coke for use in the domestic field. No doubt the present-day price of competitive fuels, oil and automatic stoker-fired coal installations requiring a minimum of attention and the present-day problems of finding suitable labour, will encourage this changeover. Coke can still provide the cheapest useful therm, however, and the replacement of coke by oil or coal is likely to be restricted to the larger heating plants where positive labour savings are possible and the capital cost of the conversion equipment can be more easily justified. It is as well to remember that not by any means all this displaced coke would be readily suitable for the domestic market even after further preparation.

A special study of the coke availability position is given by one member of the panel, and his views are given in an appendix to the Report. There are one or two points in this appendix to which I would refer.

The statement that '16 cwt. of coke consumed in the modern approved open fire is equivalent to one ton of coal consumed in the out-of-date open fire still largely in common use' is of significance since, on technical grounds, this justifies a higher price for coke compared with house coal than exists today. This could provide the incentive I have already referred to for greater production of coke. When one gets down to consumer level, however, this difference is not necessarily reflected in heating costs, since quite often the consumer prefers to accept the higher degree of comfort resulting from the use of coke but he tends to overlook it when comparing the cost of using coke with his previous coal costs. Moreover, it is always difficult to convince him that coke at a higher price per ton than coal is a better buy.

The appendix indicates how the coal necessary for the proposed additional carbonization programme could be secured by at combination of several measures:

(1) Coal suitable for carbonization now used for burning in industry, central heating, etc., could be replaced by coal unsuitable for carbonization or by fuel oil.

(2) Displaced house coal of carbonizable quality could be reserved for coking as is increasingly the practice with the best Durham coking coals.

(3) The gas industry could adopt coal blending on a major scale, not only for the new production but also in existing plants, and should take a higher proportion of non-graded coal.

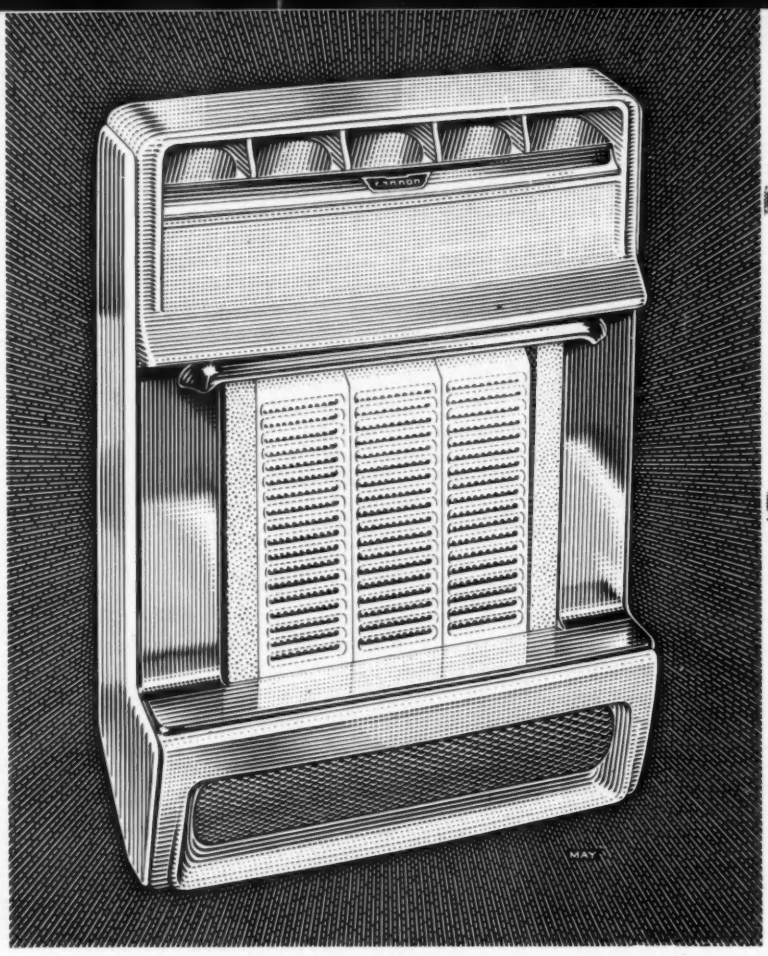
Coke Quality

Many will think that without control of our coal quality it is a waste of time endeavouring to make any progress in this direction unless coal can be bought to specification and some guarantee of continuity of supply can be obtained. It is true to say, however, that insignificant tonnages of the coals being carbonized by the industry today are of good quality, low ash and capable of producing, particularly in continuous vertical retorts, first class coke. The proposed British Standards Specification for coke would, I suggest, be met by the segregation of the coals which we are receiving into those that can be used to produce specification coke and those which cannot. It would then be necessary to select works with facilities for producing good quality coke and to divert to these works the appropriate grades of coal. They would produce coke to specification which would need to be sold at a price above ordinary coke price levels to cover additional costs involved in providing the required quality of coal, its processing and the preparation of the resulting coke for the market. With the advent of large centralized gas-making stations with two, three or more individual carbonizing units, it is possible to foresee the time when such a works could deal with coals of different qualities, segregating them into coals to be carbonized in plants producing coke for the domestic market, plants producing coke for internal works use, and to meet the needs of industrial consumers.

The introduction of blending plant at such works is also

* From 'Coke and the Beaver Report,' a paper to the Eastern Section, Institution of Gas Engineers, read on November 17.

† Coke Manager, Eastern Gas Board.



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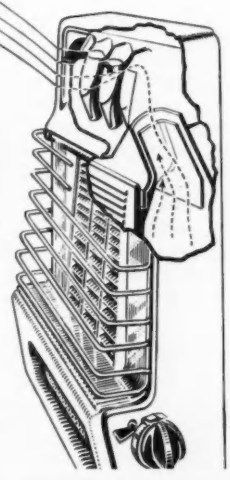

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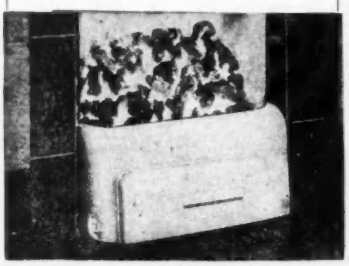

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a practical proposition. At the Tottenham Works some considerable progress is being made in this direction, and Mr. E. O. Rose, the Tottenham Divisional Engineer, made reference to this in his address to the London and Southern Section of this Institution last summer. I am aware that commercially, a number of arguments can be put against the marketing of two or more qualities of coke, but I am convinced that, with adequate safeguards, there is no reason why quality boxes for coke should not be evolved. After all, we do buy our coals on a quality basis; house coals are sold in no less than seven different quality grades.

Necessity for a Price Structure

Looking ahead, I feel that if we wish to make progress in the supply of solid smokeless fuels, we must evolve a price structure which has at least some regard to the quality of the coke being sold, even if only to recognize specification coke from the general production of coke. At present all cokes, whether good, bad or indifferent, command the same price, and there is no real encouragement, other than a sense of pride in his product, for any engineer whose primary object is the production of the cheapest possible gas therm, to concern himself with the quality of his coke. In fact there is every encouragement for him to carbonize coal giving the cheapest gaseous therm, irrespective of the quality of the resulting coke. Some method of evaluating the coke produced from each carbonizing unit seems essential if improved and consistent quality of coke is to be obtained.

The Committee recognize the difficulties in convincing consumers of the advantage of accepting coke in place of house coal—the traditional household fuel for many years—but feel that domestic consumers will ultimately recognize the advantages of the supply of this *high grade* fuel and its convenience, coupled with the major advantage of freedom from smoke and dirt. Many of the difficulties to which the Committee refer are of the industry's own making, in that coke has, in the past, been referred to as a residual to be got rid of at the best possible price that could be obtained for it. While it is obviously uneconomic to provide modern coke screening plant complete with storage hopper, bagging equipment, etc., at the smaller works, particularly if scheduled for eventual closing down, the provision of such plant at works likely to continue in operation is essential having regard to the need to maintain and improve the present price relationship of coke to coal, particularly in the domestic market. Such properties as size analysis, freedom from breeze, a reasonable moisture content, need to avoid selling cokes from high ash coals, coke used for filling scurfers in continuous vertical installations, and coke from static carbonizing units subject to unduly extended carbonizing times, do not receive adequate attention. One still finds coke referred to as a residual or by-product, and few works have in operation a regular system of quality control, involving tests for size analysis, water content and reactivity—perhaps better termed 'burnability.'

Some reduction of the shale problem is possible by crushing coals of known shale content down to ½ in. mesh so that, in the coke screening process, much of this shale will find its way into the breeze fraction. What is perhaps more important, it will more readily pass through the fire bars of the consumer's appliance into the ash box.

Cost of Coke

Mr. Evetts, in his address, gave figures to show that coke is now nearly as costly as gas for space heating. While admittedly the gap is narrowing, I find some difficulty in accepting his comparison between a flueless gas heater and an open coke fire. The comparison should more properly be between a gas fire and an open coke fire. The flueless heater should be compared with the closed type coke stove operating at an efficiency of 60%-70%. Coke, even at today's prices, will then still be found to give by far the cheapest useful therm.

The Committee deal with the assertion that coke is more expensive than house coal for domestic heating purposes. Giving figures to support the view that coke is, in fact, the cheapest form of heat, and under the prices ruling at the time of the preparation of the tables, could be increased by £1 per ton and still remain the cheapest fuel.

It would be most helpful if an accepted method of determining the cost of coke production could be evolved, thus establishing whether coke is being sold at a profit or loss. The coke manager's job has always been to obtain the best possible price for the coke he has for sale, but in my view properly prepared and sized coke has always been sold below its real value, and even today, despite recent increases, is still being sold below cost.

The greater importance of coke requires that coke be properly costed as a major product. Works cost systems now based on the cost per therm of gas into holder should, I suggest, be amended to give in addition the cost per ton of coke into sack, or vehicle, at hopper outlet. This cost should include an appropriate share of all works processing, maintenance costs, capital charges, etc., now charged wholly to gas. With this information, it would be possible to assess the true cost of coke production from different carbonizing plants and various quality coals and thus arrive at an economical selling price. In the final event, however, the price at which coke can be sold must obviously be influenced by that of competitive fuels, and it may well be that coke must continue to be sold below cost, in which case, increased production by the provision of new carbonizing plant may continue to be discouraged.

I have made some calculations debiting coke with raw material and processing costs, based on the thermal content of one ton of carbonizing coal and the thermal content of the coke produced for sale. On this basis, from the last published annual accounts of my own Board, it could be shown that the average price received per ton of coke sold was well below its cost of production. Whether this method of calculation can be accepted is, of course, open to discussion, but nevertheless, it does seem to suggest one possible basis of assessment.

Looking ahead, it does seem that some improved method of delivering coke from the works or storage depôt to the consumer is essential. The use of non-returnable paper bags has been examined from time to time but the cost, 7d. or thereabouts, for a bag to hold 56-lb. of coke leaves little scope for this method of packaging to come into general use. Nevertheless, there is an urgent need to find some economic replacement for the traditional open-mouthed sack now in general use. The modern gasworks is push button controlled —has all the latest electronic devices, etc., until one reaches the coke loading bays where progress seems to have come to a full stop. Means will need to be found to avoid the long and expensive delays involving waste of manpower and vehicles, which occur in very many gasworks during the winter months. These difficulties can quite often be traced to coke plants, designed to handle the output of a particular carbonizing unit, being called upon to handle the production from additional carbonizing plant. There is much to be said for stocking coke in sizes and using mobile debreezing and bagging units to enable it to loaded direct from stock to vehicle; the coke screening plant being used only for its proper function of screening coke as produced.

Appliances

I have always found it hard to understand why, in our showrooms, we no longer have the courage of our convictions and offer for sale coke burning appliances but prefer to call them all-fuel appliances. Surely our object in selling solid fuel appliances at all is to create a market for our coke, and we should not be afraid to make this clear to intending customers. To obtain the best results from coke, it must be consumed in appliances designed for using coke. What is of even greater importance, it is absolutely essential that these appliances be properly fitted. Complaints received of poor quality coke can often be traced either to badly-fitted appliances or to incorrect operation. The Beaver Committee refer to this factor, but what is not always recognized is that many of the appliances sold as 'all-fuel' grates by builders' merchants, ironmongers and the like, while of improved type, are not necessarily completely satisfactory when using coke. Many of them provide for alternative sets of fire bars providing wider spacing where coke is the fuel to be burnt. Unfortunately, the consumer and, I suspect, in many cases, the seller also, is not always aware of this fact. There is no doubt that, whenever possible, gas ignition is to be preferred. As an industry we should do everything possible to encourage consumers to use it. Free installation or a nominal charge only would not only ensure this, but ensure also that the appliance conformed to

the requirements of a smokeless zone by being able to be brought quickly and efficiently into operation.

It appears to be generally assumed that the open coal fire should be replaced by an open coke fire; the Beaver Committee in dealing with cost to consumers appear to have only the open type fire in mind. Having regard to the fact that in addition to clean air, the maximum production of useful heat from each ton of coke consumed is required, should not greater consideration be given to the more extensive replacement of coal grates by openable or closed stoves which have a utilization efficiency appreciably higher than the open fire? This type of appliance is also less selective of coke quality and gives a better performance on the more dense types of coke not always completely satisfactory in the open fire.

Under this heading, it is appropriate to say a few words on consumer storage capacity and access. Despite the appeals which have been made over the years, by those concerned with the marketing of coke, for increased and readily accessible storage facilities, the situation is far from satisfactory. Not only the question of suitable appliances but consumer storage facilities for fuel will need to be considered when a smoke control area is visualized if continuity of supply is to assured. Fuel storage capacity, adequate for the use of coal, will generally be found to be inadequate when used for the storage of coke. A prefabricated bin, on simple hire, may well be an answer to this problem. Blocks of flats are the worse offenders in this connection, and quite often one finds in modern buildings no satisfactory means of getting solid fuel to the upper floors.

DISCUSSION

Mr. R. Hutchinson (Leicester) said that rich gas firing was not so adaptable for quick changeover. It might meet a seasonal change but it could not cope with the peaks or a big increase in coke traffic. Experience had shown that the average consumer lacked any magpie instinct which might encourage him to store against winter demands. He described conditions obtaining in Leicester at the end of February and the beginning of March this year. On February 21, he said, the demand had been for 1,400 bags a day, with an outstanding order book of 7,000 bags. After four days of the cold spell this figure had risen to 10,000 bags. Accordingly they had hired extra lorries and by the weekend beginning February 27 outstanding orders were peaking up to 3,068 bags. They were shifting 5,300 bags a day with 19 vehicles. Such figures called for pulling out all the stops not usually used. Even so, under these abnormal conditions, they must be able to offer a product free from breeze and of satisfactory quality. And if they were to take advantage of the golden opportunity provided by the Beaver Report, they must be able to meet the needs of the hand-to-mouth consumer.

Mr. A. Blenkiron (Lowestoft) spoke of the possible production of extra coke by increasing through-put and lifting the calorific value; it was necessary either to change the declared values *or* produce more diluent. He wondered whether quality boxes were indeed the answer. As it was the housewife could not specify the type of coke required and be sure of getting it; demand for certain qualities could not be met. He wondered whether the problem of stocking and getting coke to the consumer might be eased by releasing the amount taken by merchants during the summer. In one respect the merchants were one step ahead because with the help of the Coal Utilization Council courses, many of their staffs had been instructed on how to fit appliances correctly. He thought the industry might get better results and a better reputation for coke if builders could be encouraged to fit appliances in the correct manner.

Mr. D. G. Rose (Coke Manager, North Thames) explained that he worked closely with Mr. Deas and that his remarks would be in the nature of verbal underlining of some of the important points in the paper. He felt they were all somewhat preoccupied with the domestic market and tended to overlook the fact that it was only a small part of the whole. There were very different conceptions of coke quality, but their views must always be relative to availability. There was a tendency to regard continuous vertical coke as superior, and it was well suited to certain uses. However, there would be a great deal of intermittent vertical and coke oven coke with us for a long time, whether we liked it or not. In the North Thames Board they were trying to classify coke into domestic and industrial. He felt that a lot could be done to get more domestic coke by taking appropriate action on the works. It was necessary to recognize the fact that in dealing with coke at the works and coke as it was delivered to consumers, they were dealing with two quite different commodities. It was still possible for consumers to get a really bad lot, and while that happened it was no satisfaction to the customer to be told what good stuff coke was.

On the subject of distribution Mr. Rose admitted that there was much to be done, bearing in mind varying load characteristics. With the prospect of an increasing demand for sacked coke there was need for increasing and improving stocking and handling at the works. There was also a need for better facilities at the consumer's end, particularly in the London area. They had worked hard on this problem in the North Thames where they made a minimum delivery of 5 cwt. The Board had inspected all new houses and blocks of flats and had been in touch with the housing authorities; as a result of these overtures some slight progress had been made. It had been found that less than half of the new flats could take 5 cwt. delivery; five years ago only 5% of new flats had this accommodation. The biggest factor in the cost of distribution was the amount delivered at a time. Of course, one could see the housing committee's point of view, since by saving fuel storage space in a block of flats it might be possible to get one or more extra flats in. He agreed with the author about the importance of the distributor in the selling scheme; in his own Board they had only 20 producing works but could add another thousand distributing points.

Mr. L. F. Garner (Tottenham) noted that the author thought the Clean Air Bill was likely to receive amendments directed to making it more effective; he wished he could be equally optimistic. Whatever form the Act took, however, it was evident there would be need for much more coke, and the happiest statement in the paper was that showing the very great additional tonnage of coal that could be diverted to our industry. If more coal were available then even with existing works much more coke could be produced simply by making less water gas. On a works such as Willoughby Lane this was not without its difficulties and necessitated extreme use of all available holder capacity. For months now, however, the coal gas plants had worked at full winter capacity and the additional coke production had been from 50-100 tons per day.

The proper use of producer gas dilution plants could also make more coke available for sale and two sets just going to work at Tottenham might well make available an additional 1,500 tons over the next 12 months.

He noted that the author referred to coal gas firing of settings. He recalled helping Woodall-Duckham's research team carry out investigations on this subject when he was a junior at Luton over 25 years ago. With existing settings he doubted if complete coal gas firing would be possible, but partial firing should be quite practicable. He suggested, however, that there were worthwhile savings in producer fuel consumption readily to be had if only more technical supervision could be generally given.

In addition to the effect of benzole extraction, there was one other means by which quite large additional tonnages could be made available to the domestic market—by increasing the upper size limit of No. 2 continuous vertical coke and reducing the lower limit for size 3. At Willoughby Lane, in consultation with the author, they had actually increased the upper limit for size 2 to 2¼ in. This coke gave a beautiful fire and only the odd two or three people who appeared to buy coke to look at and not to burn had passed adverse comment. On the matter of reducing the size of No. 3 however, they had not as yet quite seen eye to eye.

On every coke plant he had known, really clean nuts could only be obtained by removing a lot of perfectly good small size nuts along with the breeze. At Tottenham at present they were using 1 in. by $\frac{7}{16}$ in. breeze screens. A Pegson vibratory screen had recently been installed and when they rescreened their breeze they obtained over 20% of excellent almost dust-free nuts size ¼ in. and upwards. These small nuts burned excellently used alone; mixed back with the normal nuts the mixture must burn satisfactorily. Yet because the resultant mixture, while largely conforming to the specified limits of 1¼ to ½ in., contained a larger proportion than

normal of the smaller sizes, it was frowned upon—not on performance but on appearance.

Another contentious point was moisture content. Mr. Deas' specification 'reasonable moisture content' was the most reasonable specification he had yet heard. After an extremely difficult period trying to deal with very dry coke he earnestly hoped no specification was ever produced calling for a moisture content of No. 2 continuous vertical coke of less than 8%. With really dry coke, especially if made from weakly caking coal, the dust was a menace to plant and men. The atmosphere of the screening plant became an almost impenetrable dust haze—with a higher explosion hazard than coal dust—and the maintenance men became very worried about working in such an atmosphere. The coke loaders were badly affected, goggles and respirators lessened their difficulties, but in hot weather men developed rashes on their faces and necks. The delivery men complained strongly—and with reason—when required to tip or trim in confined spaces, and customers with indoor storage complained of dust drifting along corridors and into rooms. Further, the coke was so light that 1 cwt. could only be accommodated in outsize sacks—and the sight of a 62 in. man looking over a 58 in. sack and asking what he is expected to do with it was just too silly!

The loss of revenue following a 5% reduction in moisture was very considerable and a compensating price increase would be very unpopular with customers. And in any event the thousands of tons of coke stored in the open would in winter be delivered at a moisture content almost entirely beyond their control.

Mr. Garner concluded with a comment on the delivery of coke to flats. This was already expensive and was sure to become more so. In any logical community, people living in high flats would be using gas or electricity. They were at present, in effect, selling them coke at less than the standard price. He suggested that they should go all out to transfer this particular load from coke to gas, and be prepared to accept less than the standard price of gas to do so.

A vote of thanks to Mr. Deas was proposed by **Mr. R. C. Wardell** (Boston) and seconded by **Mr. E. H. Winch** (Cambridge).

Author's Reply

Mr. Deas, in replying to the discussion, said that the comments of Mr. Hutchinson served to confirm what he had said in his paper in regard to the effect on works loading facilities and transport of supplying the needs of consumers in a smoke control area.

Mr. Blenkiron had referred to possible difficulties in the housewife being unable to identify coke sold under a 'quality box' scheme. Mr. Deas said that while there were obvious possibilities of malpractices occurring, he felt that these were really no greater than with many other everyday materials sold on a quality basis. With regard to distributors taking a greater percentage of their annual tonnage during the summer months, this year, because of the effect of the coal and rail strikes, it had been necessary to restrict deliveries to distributors during the past summer. Normally distributors were expected to take at least some 36% of their annual tonnage during the summer and because of the limitation of stocking space at depots, it was usually found that few distributors were able to take delivery of much more than this quantity.

Mr. Rose had quite rightly drawn attention to the larger tonnages of coke other than continuous vertical coke, which would need to be sold for many years to come, and he also drew attention to the importance of markets other than domestic. Mr. Deas said that, personally, he recognized the importance of these other markets and in fact envisaged that the coke Mr. Rose had in mind would, for many years to come, be used for large-scale heating and domestic hot water installations, consuming up to say 300 tons of coke per annum.

Mr. Garner had raised a number of interesting points, in particular his reference to the fuel resulting from the re-screening of breeze. Mr. Deas remarked that the fuel which Mr. Garner had referred to was in fact a coke bean $\frac{3}{4}$ in. by $\frac{5}{8}$ in. and, while it was a perfectly good fuel, considerable wastage could occur if it was used alone in the majority of domestic hot water boilers, closed stoves and similar appliances where firebar spacing was usually $\frac{5}{8}$ in. Experience on the marketing side had shown that its sale in this market was very limited.

If it could really be *intimately* mixed back into the standard size 3 coke used for these appliances, then Mr. Garner's suggestion that this procedure be adopted had merit, though it must not be overlooked that a larger percentage of a size near the low screen mesh limit was never popular with the housewife, and could readily cause an appliance to become sluggish in operation apart from possible heavy loss of carbon in the ash box. In addition, unless smaller mesh de-breezing screens were used at hopper outlets, much of this size of coke would merely find its way back into the breeze fraction again. Personally, Mr. Deas felt that the proper outlet for this particular fuel was for use in pre-burner units such as the Suxe and Copperad, in which it gave excellent results and was a complete and economic answer to the coal-fired underfeed stoker and of course oil-burning installations.

Mr. Deas went on to say that he could not entirely agree with Mr. Garner's comments on moisture content in coke, though he fully appreciated the difficulties to which Mr. Garner had referred. These, he felt, were not unrelated to the type of coal now being carbonized. The fact remained that the public were being very much more critical of the water content of coke and some very positive action was necessary to avoid this running into double figures as it unfortunately quite often did.

PETROLEUM RESEARCH

Mr. W. M. Catchpole, Chief Research Chemist, British Petroleum Co., in presenting his paper to the Autumn Research Meeting of the Institution (*I.G.E. Pub. No. 479*) outlined the methods of research, both pure and applied, that were in use today, with particular reference to the petroleum industry. He said that the time interval between the initial demand or idea for a new product to fullscale production might be a matter of months, but in the case of new processes it might be two to three years, or considerably longer still if the economics were unfavourable. As illustrations he quoted the platforming process of Universal Oil Products; British Petroleum's autofining process for desulphurization of light distillates; and a process for treating crude oils.

It was inevitable, he said, that the motor fuels of the future would become more and more blends of synthetic hydrocarbons produced from petroleum as the octane number demanded by new cars rose. Catalytic processes already known would permit production of motor fuels of 98 to 99 octane number, but if all motor fuel was required at this high level new processes would have to be installed, and it seemed unlikely that this upward trend would be reversed by new developments in automotive engines during the next few years. Events that could, however, have an influence on future refining trends were development of the small gas turbine and of new methods of introducing fuel into spark-ignition engines.

In Western Europe, the demand for distillate fuels would tax the ingenuity of the oil industry, and the presently known processes for converting either lighter or heavier hydro-carbons to materials in the 150° to 300°C. distillation range did not appear to offer much assistance. Judged on past performance, the industry would find a way of meeting the demand, but if the gas industry was turning to oil as a source of raw materials it would be desirable to have processes with the flexibility to aid the oil industry in maintaining its balance of products by gasifying whatever range of products was surplus to other demands. No immediate change seemed likely in the trend for increased demand for residual fuels in Western Europe, and there was, therefore, little incentive, so far as Europe was concerned, to work on processes for conversion of residues to motor fuel as there was in the United States of America.

So far as other products were concerned, they were likely to decrease in proportion as the demand for the major products rose and as advances in mechanical engineering reduced the consumption of speciality products, *e.g.*, lubricants. Alongside these trends, however, there would be advances in quality through the use of new additive compounds to improve the performance of petroleum lubricants. Synthetic lubricants would probably not have a large effect on the consumption of petroleum lubricants unless the cost could be brought down.

Gas in France at the I.G.U.

Calorific Value and Interchangeability of Gases

In two contributions to the proceedings of the International Gas Union at New York (*IGU 20 and IGU 21.55*) our French colleagues surveyed the evolution of the techniques of gas production in their country and discussed the problems of interchangeability to which these give rise. Particularly Messrs. A. Bolzinger and J. Coudeville discussed the possibilities of substituting one gas for another in standard appliances and, more particularly still, the proportions in which the several gases proposed to meet peak loads can be added to the more or less standard coal gas without entailing alterations to burners at consumers' premises.

The argument is an extension of the well-known thesis put forward by M. Delbourg, reported briefly in the 'GAS JOURNAL,' July 23, 1952, p. 199. It is shown that calorific value is not in itself a sufficient criterion. Account must also be taken of the Wobbe Index ($W = c.v./\sqrt{d}$) and the Delbourg 'combustion potential' ($C = E/\sqrt{d}$), where d is the density of the gas relative to air and $E = H_2 + 0.6\,CO + 0.6\,CnHm + 0.3\,CH_4$.

At the present the standard gas used for the 'normalization' of domestic appliances in France is of a calorific value 4,200 cal/m³ at 0°C., 760 mm. (equivalent to about 440 B.Th.U. per cu.ft. at 60°F., 30 in.) with density 0.5 and W about 6,000, C about 95 (in metric units). Appliances are required to possess means of regulation to give their nominal thermal output for all pressures between 40 and 120 mm. among other stipulations. The effect of different mixtures on interchangeability is worked out in great detail and with considerable lucidity on the Delbourg Diagram.

Two bases of reference, or, say, two types of standard coal gas are taken as base load gas, one at 4,800 cal/m³ (503 B.Th.U. per cu.ft.) with density 0.48, W 7,000, C 95, the other at 4,200 cal/m³ as above. It is assumed, in each case, that gas is to be distributed at these calorific values.

The practical effect of these considerations is that different peak load gases may be added to the base load gas in differing proportions according to their composition and physical properties. The ONIA-GEGI oil gas can be added in any proportion without affecting the performance of domestic appliances. Carburetted water gas enriched to 4,200 cal/m³ can be added to the extent of 67% and so on. If, however, gas is to be distributed at 4,200 cal/m³ (440 B.Th.U. per cu.ft.) one can begin with 73% coal gas at 4,800 cal/m³ diluted by 23% blue water gas by steaming or from outside plant to 4,200 cal/m³. Such a mixed gas would have a density of 0.5 with Wobbe index 6,000 and combustion potential 93. The output of the works could be increased without limit by the addition of ONIA-GEGI oil gas at 4,200 cal/m³, practically to any extent, or by adding CWG of the same c.v., by 43% by adding propane reformed by air and enriched to the same c.v. by adding propane, by 43% with peak load producer gas enriched with oil, 30% by producer gas enriched with propane, 22% by a mixture of inert gases with rich oil gas and 19% by the same enriched by propane.

After examination of all these possibilities it is concluded that the higher calorific value (of the order of 503 B.Th.U. per cu.ft.) is to be preferred when the means of production is of the 'gaz-intégral' type with oil enrichment or oil-gas alone, or where coal gas is combined with oil-gas or CWG generators. On the other hand when it is carbonization plant (particularly with steaming) alone the lower value (440 B.Th.U.) is necessary to give sufficient elasticity to adapt the production of coke to the state of the market.

It is considered, however, that while the calorific value of the gas distributed should remain constant over, say, a year, there should be the possibility of raising it in certain cases; for example to be able to add to a base load gas at the higher value increased quantities of carburetted water gas. There is an argument in these cases for the possibility of a limited variation in the contractual c.v. around its mean value over periods of a sufficient duration, say, during the winter for six months.

In *IGU 21.55* M. Delsol outlines the evolution over the last three years in France in the methods of gas production. This evolution has followed the lines set out in the paper, *Comm. No. 404*, presented to the Institution of Gas Engineers by M. J. Kec in 1952. It is characterized by the concentration of production in large gasworks, by an increase in the quantity of gas purchased from outside sources (natural gas, coke ovens at the collieries, iron and steelworks) and by the use of materials (mostly petroleum products) recently placed at the disposal of the gas industry, the last named particularly for the production of peak load gas to meet the still increasing difference between summer and winter demands caused by the development of domestic heating by gas.

The several processes are briefly described with flow diagrams and tables of results. New constructions by Gaz de France include the coke oven plant Paris-Sud at Alfortville with three batteries each of 15 Koppers ovens supplemented by a blue-water-gas plant and a Hall oil-gas plant giving a total maximum daily gas production of 1,500,000 m³ at 4,500 cal/m³ (say 53 mill. cu.ft. at 470 B.Th.U. per cu.ft.) and another near Rouen (Grand-Quevilly) with 36 Becker ovens producing 300,000 m³ daily adjusted to 4,200 cal/m³ by the addition of producer gas (say 10½ mill. at 440). In the latter plant coke is dry-cooled in a Sulzer plant. Other developments have been reported from time to time in our feature 'Gas in France' (Abstracts from the Journal des Usines à Gaz).

AUSTRALIAN AND NEW ZEALAND STATISTICS

Total sales of gas by Australian gas undertakings during 1954 rose by approximately 1,497 mill. cu.ft. to the record figure of approximately 37,002 mill cu.ft. This represented an increase of 4.2% over 1953, and was the largest annual increase when measured by volume since that of 1950 over the dark year of 1949 when there were severe restrictions due to the prolonged strike of coalminers. Gas production for 1954 was approximately 42,980 mill. cu.ft., also an increase of 4.2% over the 1953 figure and an increase of 96.3% over 1939. Coal carbonized rose 1.7% from 2,032,000 tons approximately, to 2,066,000 tons. Oil used in the manufacture of carburetted water gas was 18,252,214 gal. and in the manufacture of oil gas, 3,436,370 gal. This was slightly less than in 1953 when a total of 21,875,000 gal. of oil was used, but there was, however, an increase in 1954 of coke used in carburetted water gas manufacture to the extent of over 21,000 tons. Gas consumers as indicated by meters in commission at December 31, 1954, rose by 2.0% for the year to approximately 1,243,000. Average consumption of gas per meter increased in capital city areas from 31,000 to 32,100 cu.ft. but in other areas there was a slight decline. Coke sales for 1954 were estimated at 663,000 tons approximately, 7.7% higher than for 1953. Miles of main shows an increase of 9.2% over 1953, bringing the total laid to date to 12,203. This increase is partly due to a re-assessment of mains laid by several undertakings.

New Zealand

Gas production by New Zealand gas undertakings totalled approximately 5,156 mill. cu.ft. during 1954, which represented a decline of only 0.8% over 1953 and an increase of 23.3% over 1939. Sales of gas decreased slightly by 1.3% to approximately 4,253 mill. cu.ft. Net revenue from gas (available in the year book for the first time) totalled approximately £2,536,000; this figure includes meter rates, minimum charges, *etc.*, but excludes discounts. Revenue from by-product sales, another new figure, totalled approximately £815,000. Sales of crude oil showed a marked increase during 1954, rising from approximately 464,000 gal. to 1,610,000 gal. Statistics for the year were furnished by 18 New Zealand undertakings, representing 88% of the total gas manufactured in the Dominion. This year, for the first time, New Zealand statistics are published separately from those of Australia.

New Gas-fired Crematorium at Hastings

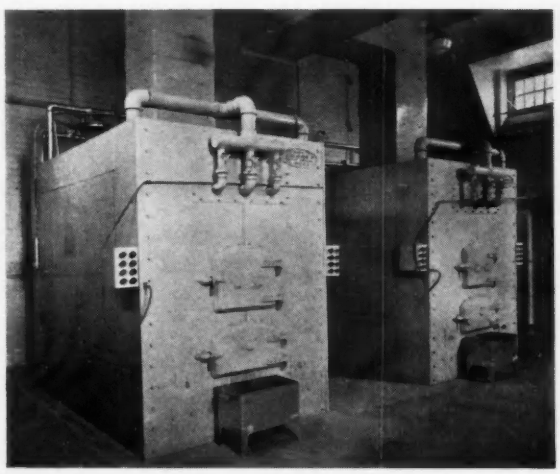
Hastings' new crematorium, built by the Corporation at a cost of more than £26,000, was opened recently by the Earl of Verulam, President-Designate of the Cremation Society. The Chapels and Garden of Remembrance were dedicated by the Bishop of Lewes, the Rt. Rev. Geoffrey H. Warde. The Hastings Crematorium is the 80th in Great Britain and the 22nd to be opened since the war. It is the culmination of many years of planning and the whole scheme is a model of simple but beautiful design. The crematorium is provided with two gas-fired cremators manufactured and installed by Radiant Heating, Ltd. They are of a design based on many years' experience in this field and many special features are embodied to ensure cleanliness, ease of operation and low running and maintenance costs. Each cremator is lined with high quality refractory, backed by insulating material to ensure the minimum of heat loss. The brickwork is supported on a mild steel base plate superimposed on a fabricated base of heavy rolled steel channel. The sides and top are encased in mild steel sheets, the front and back being fitted with cast-iron plates. The entrance through which the coffin passes is fitted with a cast-iron refractory-lined balance weight door, cable operated, the turning handle being fitted in the wall in the committal chamber. At the rear end of the cremator are two hinged doors for gaining access to the incinerating and ashpit chambers, these doors being fitted with observation ports and covers.

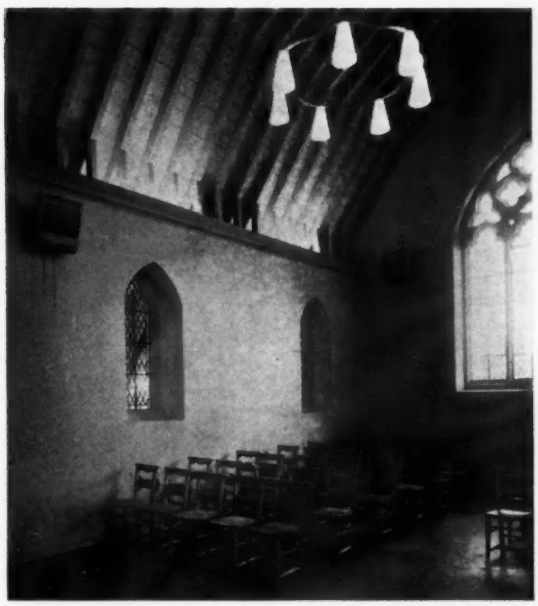
The incinerating chambers are fitted with six specially designed burner nozzles, so arranged for easy access and replacement if necessary. Two further burners are fitted at the operating end of the ashpit chamber, one on each side. These eight burners are supplied with the correct proportion of gas/air mixture from a mixing chamber, each supplied with air and gas cocks which are connected to push-pull buttons situated at the operating end of the cremator. This enables the operator to have full visual control of cremation conditions from a single viewpoint. Immediately above the incinerating chamber is a pre-heating chamber through which passes the secondary air which is so essential for the complete calcination of the charge.

Each furnace is provided with an adjustable damper, the products of combustion passing out through a short brick-lined duct arranged at the top of the cremator. The hearth of the furnace being solid, the replacement of expensive fire bars is avoided. The coffin, however, is supported on steel runners, renewal of these being extremely cheap.

The crematorium has been open but a short while and to date no actual fuel consumption tests have been carried out, but it is confidently anticipated that during normal operation the average gas consumption per cremation will be in the region of 2.5 therms. The space-heating in the chapels is by Bratt Colbran standard radiant panel heaters and gas fires have been installed in the vestries and waiting rooms. It is interesting to note that further gas-fired cremators by Radiant Heating, Ltd., are to be installed at the new Crawley crematorium and also at the crematorium at West Norwood in South London which is to be rebuilt after demolition by bombing during the late war.

Below: *Two gas-fired cremators installed at the new Hastings crematorium by Radiant Heating, Ltd.* Right: *One of the chapels showing Bratt Colbran standard radiant panel heaters.*





Cardenden Gasworks to Close

Complaints about obnoxious smoke and smell from the gasworks at Cardenden, Fife, have led to the disclosure that the works are likely to be closed within the next two years. At a meeting of Lochgelly Local Committee the County Medical Officer stated that the management were doing what they could to remedy the complaints. It had been pointed out that the gasworks were out of date and not reasonably capable of being brought up to date. It was the intention to close the works whenever pipes were laid connecting the Cardenden undertaking with other units.

London and Southern Juniors Annual Reception and Dance

On Friday, December 2, the London and Southern Junior Gas Association held their Annual Reception and Dance at Caxton Hall, London, S.W.1. The guests were received by the President Mr. N. R. Junkison and Mrs. Junkison. Afterwards Mr. Junkison welcomed the guests and expressed his thanks to those responsible for contributing to a very successful evening in particular to Mr. E. G. Duggin who was largely in charge of the arrangements. Mr. Junkison also paid tribute to the help received during the year by the Association from the respective area gas boards, particularly in the preparation of papers for presentation at their business meetings. Dr. J. Burns, Chief Engineer of the North Thames Gas Board, also spoke to the assembly. Mr. W. K. Hutchison, President of the Institution of Gas Engineers was present for a short time.

GAS CONSULTATIVE COUNCILS

Greater Powers for Councils?

Objections by individual members of the North Western Gas Consultative Council, which met in Manchester on December 1, about coke prices were ruled 'out of order' by the chairman, Alderman C. E. P. Stott. Councillor F. H. Smith of Hoylake pointed out that the increase of 32s. 1d. per ton over the past year, added to the increase of 1¼d. in the price of gas amounted to £4m.—the Gas Board's profit for the preceding year. Alderman W. Onions, maintained that there was a definite price fixing: he thought that the cost of 6s. 11d. a cwt. was prohibitive. Coke was only a by-product of the industry: he felt that there ought to be a more reasonable charge than the maximum of 6s. 11d.

In reply to Councillor R. M. Bradburn of Birkenhead, who considered that the Council had every right to discuss the matter, the chairman pointed out that the Council had every right to express its opinions about structure, but financial matters were 'not our business.' The Council had no jurisdiction with regard to coke prices. What it could do was to act uniformly as agent of the domestic and consumers' councils. If it came to a matter of principle, they must refer to those bodies. If the Council wished to protest on behalf of consumers against any part of the Coke Marketing Scheme, he would raise the matter with the appropriate body, which was the Ministry of Fuel and Power.

Alderman W. Burrows of St. Helens complained that the powers of the Council were very limited and should be widened. Many of the suggestions made were just a waste of time. How many questions of vital importance, he asked, had been approved by the Board, particularly on the price of coal.

Representation

In reply to a further question about adequate representation on the Coal Consumers' Council, the chairman said he would get a list of representatives on the Council. He reiterated that the Gas Board had no obligation at all to report anything to the Consultative Council in regard to coke.

There was some dissension over installation charges, which amounted to 9s. per hour by the Board as against 6s. by the Employers' Federation. Several members did not see how the Board charge could be less when all other commitments had been considered: the opposition contended that the Board was making a 50 per cent. profit and that extra charges against every little job made each one extravagant. In answer to a written request from the Council, the Board stated that it did not wish to give further publicity to coke prices and availability. It was stated that the Board had some 135,000 tons of coke in stock compared with 203,000 tons at the same time in 1954: the Board was concerned to ensure that they were able to give full supplies to all regular users throughout the winter.

The Board's reply to a request for time switches on cookers and modifications allowing for freer movement of appliances was criticized as showing lack of imagination. Councillor Mrs. W. M. Mitchell commented that only a man could have given such an unsatisfactory reply to a question which was the concern of a woman.

Identification of Meter Readers

The South Western Gas Consultative Council at its meeting at Taunton on December 1 agreed by 16 votes to six to express to the Gas Board its opinion that the wearing of uniform by meter readers and collectors throughout the area would be the best means of identification to safeguard householders. A newspaper report was read of an elderly woman in Birmingham being attacked and robbed on the previous day by two men posing as Gas Board meter readers. The Council expressed appreciation of action recently taken by the Board to identify their meter readers and collectors. Employees will carry an official letter and a consumer will be able to require them to quote the number of her meter before admitting them.

Mr. T. N. Dent, of Bath, representing the Board, said that after prolonged negotiations with representatives of the employees, uniforms would be worn as a condition of employment in districts where the majority of employees wished them, but not elsewhere. The Deputy Chairman, Mrs. B. J. Shell, felt that confusion and misunderstanding would result if some districts had a uniform and others not, but Alderman D. H. Miller-Barstow, of Weston-super-Mare, thought that uniform should be a condition of service in the gas industry and if employees did not like it they could obtain another post. Mr. W. F. Hender, of Launceston, said he had been shocked to hear that the Board had been 'dictated' to by its employees as to whether they should have uniforms, but Mr. M. R. H. Morland, of Glastonbury, pointed out that it would be foolish not to consult the employees who, in a small town like Glastonbury, were so well known that uniforms were unnecessary, whereas in larger towns it would be a good idea.

Dr. D. C. Green, of Martock, felt so strongly about the new regulation that he likened the gas industry to Mussolini and Hitler, who 'put their people into uniforms.' He felt that attacks on consumers could be put into proper perspective, they were, he added, 'probably .0001%' of the number of visits made by meter readers. Complaints that penny slots in prepayment meters had been stopped up by the Gas Board without previous notice being given to householders were made. It was felt by some members that it was discourteous of the Board not to have told the Council of this change of policy, so that a reasonable explanation could be given when customers brought complaints. Mr. T. N. Dent, representing the Board, said that it was hoped in time to remove all penny-in-the-slot meters, which were expensive to maintain and collect. Where hardship was created, particularly in the case of old age pensioners, the penny slot would be restored.

More Gas Used in the West Midlands

Although the fine weather affected sales of gas in the West Midlands the general trend towards increased use of gas is unchanged. In the six months to the end of September the increase was of the order of 3%. Therms per ton have also gone up to 82.4 from 80.1 a year ago. These were the features of a progress report given to the West Midlands Gas Consultative Council meeting in Birmingham on November 21 under the chairmanship of Alderman W. H. Malcolm (Coventry).

Mr. G. le B. Diamond (Chairman of the West Midlands Gas Board) told the council the therms per ton figure was probably as high as any that had been attained in the country. On the subject of manufacture he also pointed out that the plans made for the proportionate quantities of coal gas and water gas to be produced during the summer had to be revised in view of the coal supply situation in June and May and it had been necessary to make every effort to obtain as much gas as possible from the reduced coal supplies. During the strike it was essential to increase the manufacture of carburetted water gas, although this meant the wasteful and expensive standing by of carbonizing installations. Subsequently it was possible to revert to normal practice involving a minimum of water gas production and the warm weather had enabled coal gas production to be maintained under conditions ideal for the building up of coal stocks, low coal throughput with a consequent high thermal yield. This normally involved a lower production of coke but in fact the reduction in consumption of coke for water gas and on boilers had resulted in a higher production for sale per ton of coal than had ever been achieved since records were first started.

Carburetted water gas efficiency improved upon last year and a recalculation using the method recommended by the British Standards Institution for a limited number of large works able to supply the accurate information necessary indicated that so far this year the gaseous yield from oil was better than had been supposed, 1.29 therms compared with 1.17 on the old basis of computation.

W. C. Holmes Entertain the Manchester Juniors

After being entertained to lunch at the George Hotel, Huddersfield on November 30, by W. C. Holmes & Co., Ltd., 150 members of the Manchester District Junior Association of Gas Engineers toured the works, in the course of which they were able to inspect live exhibits. Each had a guide attached who was able to answer questions. Among the exhibits was part of an ammoniacal liquor still, 4 ft. 6 in. in diameter with 12 trays, each fitted with two oval bubble hoods and designed to treat 500 gal. of liquor per hour. The design of the trays ensures equal division of the flow of liquor along both sides of the hoods and this was demonstrated in one tray by the addition of a soluble dye.

A Holmes-Kemp instrument air dryer of the silica-gel adsorbtive type with a capacity of 24,000 cu.ft. per hour of air at 100 lb. per sq. in. newly painted and awaiting delivery was also seen. This one, although not the biggest that Holmes have made, is large. The need for these units has been brought about by the increasing use of automation and instrumentation and its need of moisture free air.

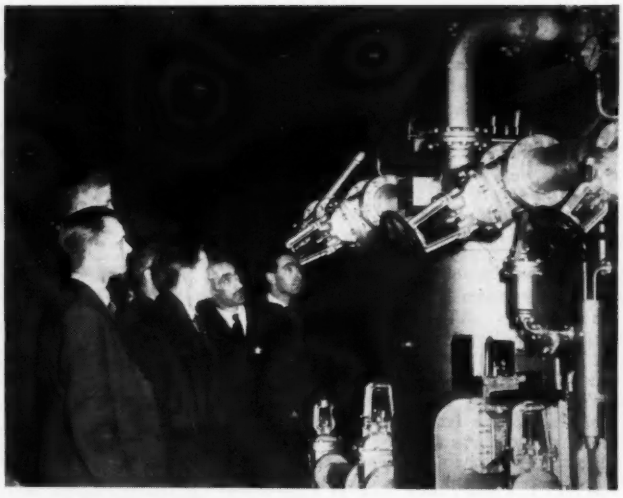
A composite exhibit in the plating shop comprised a steam-driven Holmes-Connersville exhauster running at a low speed and supplying air to a Holmes-Connersville meter. The exhauster was a 5¼ mill. cu.ft. a day machine and the meter had a capacity of 3.6 mill. cu.ft. a day. Adjacent to the meter was a remote indicating dial tachometer and chart recorder which were electrically connected to the meter and recorded and indicated the rate of flow of gas through the meter in cu.ft. per hr.

A propane/butane/air mixing unit and a Holmes inert gas purging machine were also on view, but great interest was aroused over the new Holmes-Western valve. The type demonstrated was 30 in., electrically operated. This valve contains no mild steel and is able to withstand twice the working pressure of the old design. It was explained that springs, spindle and nut can be changed with only a brief by-pass being made. In the same department the Western valve was seen pneumatically operated but control can be manual or automatic, local or remote. A patent 'Castell' locking system for manually-operated valves was exhibited.

A multi-film benzole washer designed to extract 50% benzole from 6 mill. cu.ft. a day had been erected for inspection. The B.M. meter shop, where meters in various stages of construction and test were seen, was popular. The B.M. meters were designed for industrial consumers. Many were undergoing test by the Ministry of Fuel and Power and many were packed up and awaiting shipping space for export.

The Holmes-Schneible multi-wash collector designed to handle 500-600 cu.ft. of dust laden air per minute was also inspected, for which purpose part of the plant had been made of perspex. The Elex laboratories, working exclusively on electrical precipitation, were an insight into W. C. Holmes' intention to battle with the smog problem.

Many other departments and shops were seen by the visitors, but it is not possible to mention them all. At the conclusion of the visit the Juniors were entertained to tea in the canteen. Mr. H. Partington, President (North Cheshire Group, North Western Gas Board) thanked W. C. Holmes & Co., Ltd., for their kind hospitality and most interesting and instructive visit. Mr. F. B. Holmes (Chairman, W. C. Holmes & Co., Ltd.) replied. Members then heard Mr. V. E. Chancellor (Senior Engineer, Production, North Western Gas Board) read his paper 'Consideration of the Preparation of Coke for Sale.' An abstract of this paper will be published, together with the discussion, in a later edition of the JOURNAL.



Left: *Mr. F. B. Holmes, Chairman of W. C. Holmes & Co., Ltd., speaking after tea in the canteen. On his right is Mr. H. Partington, President of the Manchester Juniors.* Right: *Visitors inspect the Holmes-Kemp instrument air dryer.*

Smokeless Zone for Edinburgh

The first smokeless zone in Scotland has been established by Edinburgh Town Council, who last week made an order defining an area in the west of the city where, after January 1, 1957, 'no person shall emit or allow the emission of smoke from any premises occupied by him.' The Order is made under powers conferred on the Corporation by the Edinburgh Corporation Order, 1950.

Plans for a smokeless zone in the central area of Glasgow are well advanced, but the stage of applying for an Order has not been reached. An exhaustive survey of the projected smokeless zone was completed a year ago, and the Corporation could then have sought powers under the existing legislation. It was decided, however, to await the outcome of the Clean Air Bill, now before Parliament, in view of the prospect that it would give general powers for the whole country, so that there would be no need to apply for special powers. It has been emphasized that there is no thought of abandoning or altering the scheme; it is simply deferred pending developments.

At a social meeting in Cowdenheath, Fife, Mr. A. Drysdale and Mr. A. Cameron, two employees of the Cowdenheath district of the Scottish Gas Board were presented with monetary gifts from their fellow employees on their leaving the employment of the Board. Mr. Drysdale has been employed by the Board locally for the last 16 years and Mr. Cameron has completed 27 years' service in the gas industry. The presentations were made by Mr. W. T. Gilchrist, district manager, and Mr. R. Air, who recently retired from the position of distribution superintendent

Board Chairman at B.G.S.A. School

The British Gas Staff Association held a week-end school at the Holiday Fellowship Guest House, Longshaw, near Sheffield, on November 19 and 20. The students came from the North Western, West Midlands and East Midlands areas. Mr. C. C. Holt, of York, the Vice-Chairman of the Association, presided, and Mr. H. J. Arnold (National Organizer), Mr. A. L. Cockrill (Northern Organizer) and Mr. L. H. Tune (Midlands Organizer) supported. The general organization of the school was in the hands of Mr. D. Anderson, of Manchester, the Honorary Secretary of the B.G.S.A.'s North Western Area Council.

In addition to lectures by Mr. Sydney Smith, Chairman of the East Midlands Gas Board, and Mr. F. L. Ffoulkes, Industrial Relations Officer, East Midlands Gas Board, the School was addressed on joint consultation by Mr. E. C. Eagle, Staff Tutor at the University of Nottingham. Groups also discussed in detail various aspects of joint consultation and exchanged experiences.

Mr. Sydney Smith said he wished to stress that no individual, no one function, no one section and no one department was more important than the organization as a whole. 'If human relations are good, almost any form of organizational structure will work and work well; if human relations are bad then results will be bad, however theoretically perfect the organizational structure may be,' he said.

Other things being equal, the form of organizational structure would certainly affect the efficiency and the well-being of the organization as a whole. So what was the answer? It behove each to do his best, not only to become as expert as he could in his particular work or function, but also to endeavour to appreciate the basic problems of the other people with whom he was working, and who might have different responsibilities. Friction nearly always stemmed from lack of sympathy and understanding. And this lack of understanding stemmed from ignorance. 'If we can all, therefore, replace our ignorance with knowledge of the problems which our colleagues—the chap at the next desk, or in the next department, or in the next town, or the one below or the one above—are striving to solve, we shall in helping others be indirectly helping ourselves; and by so doing will be part of an organization which can face up confidently to any obstacles which the future may have in store for us.'

Mr. Ffoulkes addressed the school on the duties of an industrial relations officer.

Dealing with the various aspects of his Board's policy, Mr. Ffoulkes referred first to recruitment, pointing out that the present labour position put a strain on management in trying to secure efficient staff of the right type. Attractively worded advertisements were needed but, inevitably with the present over-full employment, standards had had to be lowered. Promotion, said Mr. Ffoulkes, should be solely on merit, although, other things being equal, length of service should count.

A good management naturally preferred to promote employees from within as the men or women already employed were known, both as regards their good and their bad qualities. It was, however, a most difficult task to select the right man for the job, especially for managerial positions. Mr. Ffoulkes believed that it was in the interests both of the Board and of employees that vacancies should be advertised.

The East Midlands Board, he said, does not insist on automatic retirement at age 65 or 60, but reviews each case about three months before normal retirement age is reached, to ascertain whether the employee is physically and mentally fit and doing a necessary job.

Mr. Ffoulkes said that the duties of an industrial relations officer were mainly advisory. He had, therefore, to achieve his ends by persuasion rather than by mandate. He must try to ensure that the personnel policy of the board was sound and was put into practice by every manager at every level; and he must satisfy the employees (and their trade unions) that collectively and individually they were being fairly treated. Without being an expert himself he must work with experts. All the time he was dealing with problems which went deep into the heart of every individual; which were matters of judgment and personal opinion; and for which there was no scientific or textbook answer.

Paisley Corporation has agreed to revert to freedom of choice for electricity or gas to be installed at 252 houses now being erected. It has also been agreed that both electricity and gas facilities be provided for each house in future developments.

In connection with a new I.C.I. project at Billingham for producing ammonia from synthesis gas made by pressure gasification of oil with oxygen, Imperial Chemical Industries, Ltd., have placed an order with Robert Dempster & Sons, Ltd., of Elland, for Gastechnik Purifiers using pelleted oxide of iron. A pressure section will remove the hydrogen sulphide remaining after a pressure washing process, and a low pressure section will remove the hydrogen sulphide from the carbon dioxide liberated from the washing process. As an essential to the process, the plant will include a solvent extraction process for recovering sulphur from the spent pellets, for re-use.

GAS SPACE-HEATING FOR NEW PUBLIC HOUSE

Gas space-heating has been used exclusively in the two bars of the recently completed 'Golden Lion' public house at Debden, Essex. The heating is supplied by two sets of three Halcyon heaters, manufactured by William Sugg & Co., Ltd.—one set in each bar—set into the wall and screened from view. One set is shown here with screen removed. The Halcyon consists of a gas burner, a heat exchanger and a small electric fan in one compact housing. Air is drawn into the base of the heater, warmed as it passes over the heat exchanger, and discharged into the room through louvres at the front. Distribution of the warm air is assisted by the fan.

Power for Uganda

A number of important guests from the fuel industries and their wives were invited to the Earl of Doncaster Hotel, Doncaster on November 28 to view the film 'Power for Uganda' which was presented in sound and colour. The host of the evening was Mr. O. Kier, Chairman and Managing Director, J. L. Kier & Co., and Chairman, Owen Falls Construction Co. The film told the story of the building of the great dam across the Nile at Owen Falls; the dam is only a short way from the source of the Nile at Lake Victoria. In an address before the film Mr. F. C. Fieldsend of J. L. Kier's outlined the companies task within the construction company which was formed. The civil engineering contract was for £6 mill. and the work took five years to carry out. Sequences taken on site and animated sketches built up for the audience a lucid picture of the magnitude of the work. Other shots taken in the United Kingdom engineering works of other contractors added interest to the film. The climax came when, for the first time in the history of the world, the waters were stopped pending the arrival of the Queen to open the dam and set the generators in motion. Excellent photography with close-ups of Her Majesty and the Duke of Edinburgh were a fine end to an imposing film.

After the dinner that followed Mr. F. C. Fieldsend proposed the toast of the guests. Among these were Mr. Maurice Kelly, Chief Engineer, North-Eastern Division, National Coal Board, Mr. T. Albone, Civil Engineer, North Eastern Gas Board, Mrs. Bond, wife of the Deputy Chairman, Yorkshire Electricity Board (Mr. Bond was indisposed), Mr. B. D. Wilson, G.E.C.-Simon-Carves, Mr. H. Fishburne, W. J. Jenkins & Co. Ltd., Mr. J. H. Nicholson, Chief Engineer, Yorkshire Electricity Board and many others. Mr. Maurice Kelly replying, thanked the Company for an excellent evening. With it had grown an increased respect for Kiers and he suspected that many like himself had no idea that the Company was so large. He also thanked them for asking the ladies. It was a very generous gesture. A short and amusing speech on behalf of the non-technical guests by Mr. Lawrence Diacono ended the evening.

It was also revealed during the evening that J. L. Kier & Co. have nearly completed the coal preparation plant at Manvers Main Colliery. This plant, the biggest in England and believed to be the biggest in the world, handles 1,200 tons an hour from four pits. Some of the coal is delivered underground. Work will soon be commencing on a similar plant at Cadeby, where the Consulting Engineers will be Husband & Co.

Shipley Highway Committee has approved in principle the second stage of the conversion of street lighting from gas to electricity, which provides for the installation of 305 lamps at an estimated cost of £8,230.

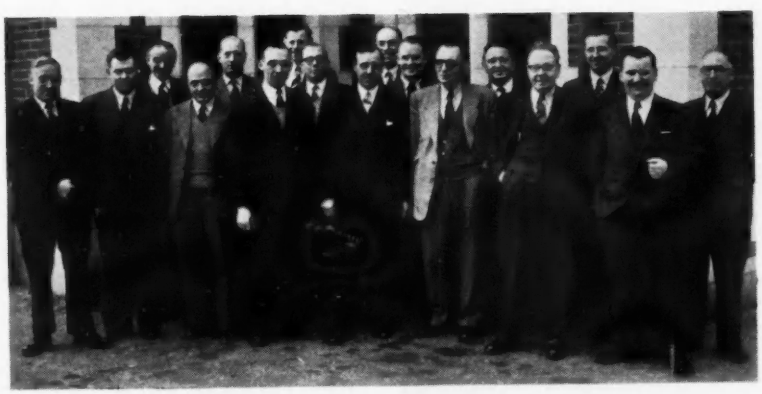
FLAME-FAILURE DEVICES ON DISPLAY

General view of the stand of the Industrial Section, Sussex Division of the South Eastern Gas Board on which was shown a number of safety taps, and a display stressing the use of a lighting torch.

The Sussex Industrial Accident Prevention Group of the Royal Society for the Prevention of Accidents staged a small but interesting exhibition at the Hotel Metropole, Brighton, during National Industrial Safety Week, October 24 to 29. A display of safety devices was shown by the industrial section of the Sussex Division, South Eastern Gas Board, and included flame-failure devices by Honeywell Brown Ltd., Sperryn & Co. Ltd., Perl Controls Ltd., De La Rue Ltd. and Monitor Gas & Oil Engineering Ltd. In addition, safety cut-off valves and back pressure valves by Keith Blackman Ltd. were featured on the stand of the South Eastern Gas Board. The exhibition was also notable for a demonstration of safety aids by the Ministry of Labour and National Service —Factory Department, and on the nine trade stands were depicted the safety products of Pyrene Co. Ltd., Wallach Bros. Ltd., W. & E. Moore Ltd., Associated Portland Cement Manufacturers Ltd., Alexander Duckham & Co. Ltd., Furmoto Chemical Co. Ltd., Mirlyn Ltd., Siebe Gorman & Co. Ltd., and Plus Fifty Protective Footwear Ltd.

The exhibition, which was opened by the Mayor of Brighton, Alderman J. A. Trevelyan Leak, J.P., attracted some 800 visitors, mostly from the industrial establishments of Sussex, and aroused considerable interest in the prevention of accidents in factory and workshop.

WALES AND MON. JUNIORS VISIT TO BEGWACO



A group of members of the Wales and Monmouthshire Junior Gas Association pictured on the occasion of their recent visit to Begwaco Meters, Ltd., of Farnworth, Lancs., on November 16.

TRADE NEWS

Hydraulic trench digging

During the short time the Dinkum Digger has been in production it is claimed to have already found a ready market as far afield as Ireland, Belgium, Austria, Italy, Africa, Malaya and even Australia, and even in such highly industrialized countries as Holland and Germany. The operation of the Dinkum Digger is entirely hydraulic, the power being derived from a small pump mounted on the front of the tractor. The machine itself is mounted from the tractor rear axle and the hydraulic lift of the tractor can be used for raising it into the transport position.

The hydraulic rams are controlled by two-way valves operated from a seated position on the tractor by the driver, who being over the trench has full view of all operations. A specially designed safety relief valve ensures that the tractor engine cannot be stalled and thus full power is always maintained. An important feature of the Dinkum Digger is that the digging and lifting rams are located above the jib, where they cannot be damaged by soil abrasion or careless handling.

The rear end of the machine is supported by adjustable legs, which are designed to make it possible to use the machine even on sloping ground and on hillsides. The weight of the digging apparatus is transmitted to these legs by a small single acting ram. To add to the usefulness of the machine other attachments are also available, including a fore-end hydraulic unit with interchangeable bulldozing and backfilling blade and shovel. Any of these attachments can be operated with the Digger in position and a specially made cab can be fitted to the tractor so that operator is working under cover in comfort at all times.

The Dinkum Digger in action.

In spite of the fact that a great number of improvements have been included in the design of the Dinkum Digger and the increased cost of labour and materials, it has been possible to maintain a price constant ever since the machine was first offered. This together with the versatility and manœuvrability of the machine have greatly contributed to its success, which was borne out by the fact that one user has recently placed his 19th repeat order with the Major.

Models of the Digger can be supplied to fit the Ferguson, Fordson Major, County Crawler, and Platypus tractors.—*Whitlock Bros., Ltd., Great Yeldham, Essex.*

Industrial cleaning

Filtavac, Ltd., manufacturers of portable industrial vacuum cleaning plants, announce a new development which is claimed to overcome what, up to now, has been the one weakness of industrial vacuum cleaners. It is an attachment for coupling to their Model RM22 machine in a matter of seconds for large-area floor and gangway sweeping which can then be executed at a smart walking pace. Without interfering with production, dust and dirt are said to be efficiently removed, and an adjustable slide incorporated in the tool allows the removal of the usual factory debris—all without raising any harmful dust.

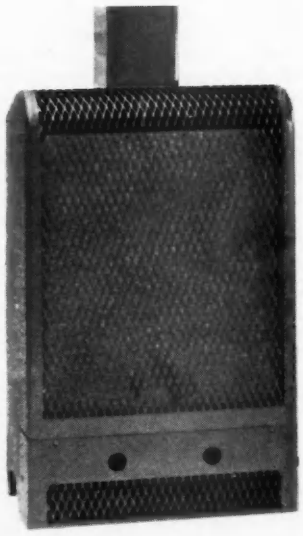
The new attachment, called the 'Chevron Floorsweeper' is claimed to be the only tool of its type produced in the world. It is made in three standard widths of 18, 24 and 30 in. For extra large areas—aircraft or motor car factories, *etc.*—there is a 50 in. width for the Filtavac RM44 twin.

In many cases this attachment might obviate the need to install expensive, cumbersome, rotary-type floor sweepers—the Filtavac machine having the added advantage of being quickly adapted for its original use as a general purpose heavy-duty suction cleaner for machinery, walls, structures, flues, and furnaces.—*Filtavac, Ltd., 64a, Kensington Church Street, W.8.*

Flued convector

The Wellsway heater consists essentially of a gas-fired heat exchanger. Seven No. 4 industrial jets fire into a flat steel box coated with acid resisting vitreous enamel. The products of combustion pass up this box and across into a second box mounted vertically behind the first. From this second box the flue leads off, usually upwards to an ordinary terminal. If required, however, the flue can project from the back of the apparatus and be inserted into an ordinary fireplace chimney.

Round the two heated boxes flows room air which is drawn in through gauze-protected apertures at the bottom. The warmed air rushes out at the top of the front grille and its momentum is enough to carry it some feet into the room before it begins to rise by buoyancy. A large volume of warm air is made to flow out of the top of the apparatus, while the products of combustion pass away to the outside air through the flue provided. Some of the difficulties which are associated with flueless heating are thus eliminated, and although the thermal efficiency is a little lower—it is approximately 75% as compared with 90% for flueless heating—this is claimed to be partially compensated for by the reduced amount of ventilation necessary. There is also an appreciable radiation component in the heat output which is probably about 10%, although this has not yet been measured. This radiation component, which comes from the front of the heat-exchanger, is useful to warm the floor and to provide a heat-focus—a spot where one can warm one's hands on a chilly morning before starting work.



The Wellsway flued convector.

The Attewell Engineering Co., Ltd., are preparing to issue 3 ft. long flue-casing sections which can be easily fixed to the wall. These sections will be finished in the same hammer-finished enamel as is used for the case of the heater, and by their use, it is claimed, a very neat installation can be made.

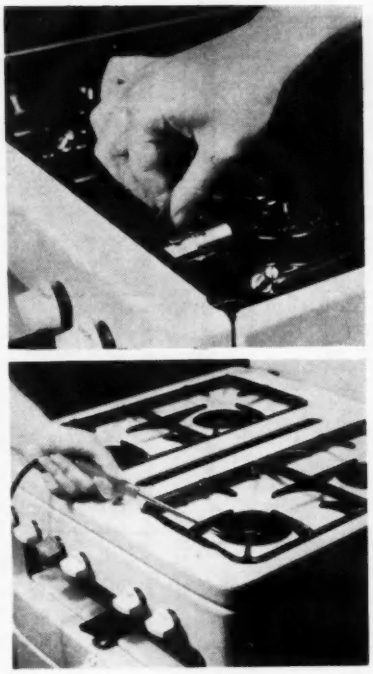
Under the stimulus of the Watson House staff, special attention has been paid to ease of maintenance. The heat exchanger is bolted together, and the unit can be taken from the case by removing four screws in the base of the appliance. The burners are reached by undoing seven screws in the bottom of

the heater and the whole burner assembly then lifts forward after breaking the gas connection.

The Wellsway heater is recommended for use in industrial buildings, drawing offices, *etc.*, where the building is too low for satisfactory use of overhead radiant heat, where flueless convectors are undesirable because of the poor comfort conditions they would give rise to and the danger of condensation taking place, and where unit heaters would cause too great a draught.—*The Attewell Engineering Co., Ltd., Devonshire Building, Wellsway, Bath.*

Automatic ignition

The Parkinson Stove Co. Ltd., have introduced significant additions to their new Pearl cooker, a self lighting front right hand burner and torch, and a range of coloured fascia panels. An interesting feature is that for the first time a form of automatic ignition is available on a cooker within the popular price range. The front right hand burner, the one most in use, can be had as a self lighting burner. The automatic ignition to this burner is provided by a pilot jet, fitted to the gas rail. The pilot is protected by a shroud and has an independent control so that it can be turned off. A gas torch is fitted to the lighter elbows and can be lit either from the pilot itself, or the self lighting burner and used for lighting any of the other burners required. The idea is simple in conception and completely positive in operation.—*The Parkinson Stove Co., Ltd., Stechford, Birmingham.*



Pearl automatic ignition. Above: *A coin is inserted in the slot on top of the pilot; when the slot points from back to front of the cooker the pilot can be lit. The gas torch is fitted to the lighter elbow on the left hand side of the cooker and can be lit either from the pilot itself or the self lighting burner. From the torch any other burner can be lit.*

Dust collection

The firm of Davidson & Co. Ltd., have for many years been foremost in the design and installation of plant for the removal and collection of fume and dust arising from industrial processes, and 'Sirocco' dust collectors of various types have established a reputation for efficiency and diversity of application in practically all industrial fields, not the least of which is the collection of flue dust from boiler installations.

Basically a development from the well-known 'Sirocco' cellular dust collector that has already established its pre-eminence both at home and abroad, the R type collector incorporates an important new principle of operation whereby the finer particles of flue dust are also trapped to such an extent as to render the provision of a secondary collector unnecessary, thus offering a most economical solution, it is claimed, to the problem of flue dust emission as affecting the smaller industrial undertakings under the proposed new statutory requirements.

The 'Sirocco' R type collector consists of standard sized cells fitted with fixed vanes built up into banks, the number of cells in the bank depending on the volume of gases to be treated. The vanes are of cast iron cast in one piece and the rest of the collector is manufactured of mild steel, the standard construction being $\frac{3}{16}$ in. thick for the cells and $\frac{5}{16}$ in. thick for the tube-plates in which they are mounted. The whole bank is suitably braced and stiffened to make it a rigid unit.

The collector depends for its operation on the gases being given a rapid swirl by the vanes on entering the cell, and the centrifugal force thereby imparted throws the dust in the gases to the outside of the cell where they pass through a circumferential slot into the collecting hopper. The main body of the gases from which the dust has been taken passes straight through the outlet back into the flues.

The special feature of this collector is that a small amount of air is automatically recirculated, carrying the dust out through the circumferential slot and depositing it in the collecting hopper, when the partially cleaned air is returned to the cell by an opening at the back of the vanes, which in turn are designed to promote this recirculating flow. This recirculation of part of the gases has a predominating effect on the efficiency of collection with the smaller sizes of particles in the flue gases, thus ensuring that when finally released to atmosphere the gases have been rendered relatively free from solid matter.—*Davidson & Co. Ltd., Sirocco Engineering Works, Belfast.*

Sweat soldering

A new material has recently been developed by Fry's Metal Foundries Ltd., for sweat soldering in the field of low temperature brazing. F.E.F. Silver solder paint is made from Silver solder which is finely powdered and mixed with silver solder flux and gelling agent and is claimed to combine all the essential features—low melting, good fluidity, joint strength and ability to joint dissimilar metals. The grade of solder used in the paint, is in full accordance with B.S. 1845, type 3, and has the following properties:

Melting range, 620 to 630°C.
Tensile strength, 30 tons per sq. in. (47 kg. per sq. mm.).
Elongation, 35%.
Brinell Hardness, 131.
Electrical conductivity, 21% I.A.C.S.

It is said to be suitable for individual jobs or for mass production and the work can be carried out by unskilled labour. F.E.F. paint is normally applied by stick or spatula and there are a variety of methods of heating including spot torch, soldering oven, muffle furnace, electro gas, electrical resistance, and high frequency induction.—*Fry's Metal Foundries Ltd., Merton Abbey, S.W.19.*

TRADE PUBLICATIONS

Nuclear fire detection

The Minerva Detector Co., Ltd., of Red Lion Street, Richmond, Surrey have published an illustrated brochure which describes the Minerva system of fire prevention by nuclear detection. It is claimed that by this system incipient fire can be detected before any heat is generated or flame occurs.

World-wide plant

A booklet published by the Power-Gas Corporation Ltd., of Stockton-on-Tees, entitled *Chemical Plant* describes the design and manufacture of plant and equipment for the gas, chemical, petrochemical, petroleum, and iron and steel industries in many parts of the world. The booklet is well illustrated with several photographs of the plant, and contains translations of the descriptions in German, French, and Spanish.

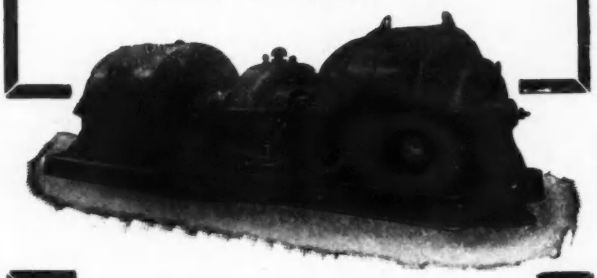
Gas washing and blowing

A booklet published by W. C. Holmes & Co., Ltd., of Huddersfield, deals with the *Multi-Wash System* for the collection and cleaning of dust laden gases and fumes. The booklet includes many clear diagrams and photographs to illustrate the subject. Another of the company's publications gives details of the recently designed Holmes-Connersville RBS blower which is said to have stronger shafts, steel impellers, and larger bearings, and to be suitable for higher speeds and pressures than the same size of machine in the standard range.

TURBO-
COMPRESSORS
& EXHAUSTERS
FOR AIR AND GAS

★ ★ ★

We build a complete range of Compressors & Exhausters for air and GAS, suitable for all purposes connected with the GAS industry, including Turbo-Compressors for large capacities, as illustrated below



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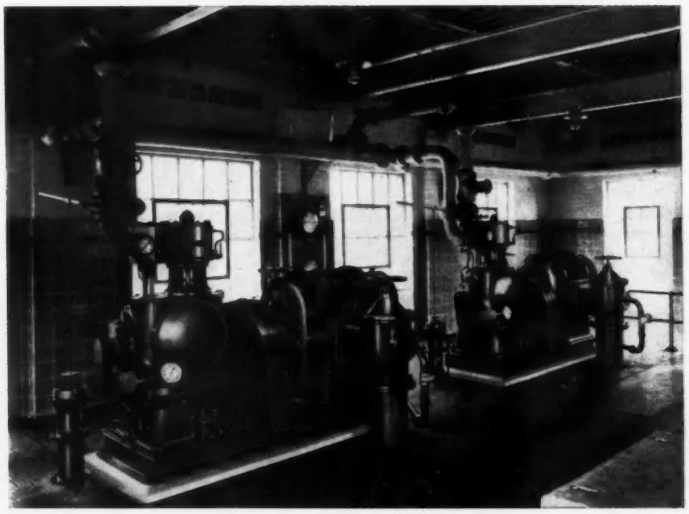

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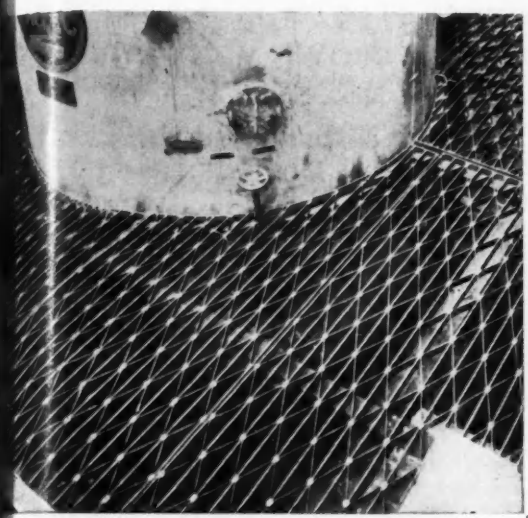

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LARGEST MANUFACTURERS OF GAS MAIN BAGS.
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Gas Bags for Repairing Mains

PATENTEES OF THE
DENMAR BAG
Impervious to Main Liquor and Climatic Influences.

Round or Cylinder Shape.

Pull-through and Expanding MAIN STOPPERS.

All types of INDIA-RUBBER BOOTS.

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HOSE AND TUBING FOR ALL PURPOSES.

Contractors' & Miners' Woollen Jackets, Trousers, Hats, &c.

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FROM STOCK
10" & 12" New Cast Iron Flanged Pipes 9' & 12'
4" Reconditioned Cast Iron Flanged Pipes 9'.
VALVES
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GAS, WATER, & STEAM
Sizes ¼" to 36" in C.I. Gun Metal & Steel.
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All sizes up to 24" Flanged, Plain ends, Screwed & Socketed, Loose Flanged, Victaulic & Unicone Joints.
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Manufacturers of Best Staffordshire Blue, Brown and Red Engineering Bricks
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SAVILE TOWN, DEWSBURY, YORKS.
Supply:–
"BROWNOX-de-LUXE" PURIFYING MATERIAL
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EWART CHAINBELT CO., LTD.
DERBY, ENGLAND
Driving and Conveyor Chains of the best quality; made of Ley's Celebrated Blackheart Malleable Iron.
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ONE OF THE FIRST AND
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GAS RETORTS
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STOURBRIDGE, ENGLAND.
INSULATING BRICKS, RECUPERATOR TUBES, SPECIAL SEMI-SILICA QUALITY FOR SEGMENTAL RETORTS WITH NO EXPANSION OR CONTRACTION AT 1400° C
Manufacturers of
Fire Bricks, Lumps & Tiles
OF EVERY DESCRIPTION

PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/8d.

Subscription Rates: Home and Empire:—60/- per annum; Foreign:—70/- per annum. (Both payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/- per line (approx. 7 words)—minimum charge 10/-. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10 in. deep × 7 in. wide: block screen 120.

BUSINESS MANAGER: S. T. CULLEN

MIDLANDS MANAGER: G. B. Torrance, 42, Wychall Lane, King's Norton, Birmingham, 30. *Telephone:* King's Norton 3868.

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

SOUTHERN REPRESENTATIVE: A. Engelhardt, T.D., 11, Bolt Court, Fleet Street, E.C.4. *Telephone:* Fleet Street 2236-7.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: FLEet Street 2236-7. *Telegrams:* Gasking, Fleet, London.

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Oxide supplied on loan or sale outright.
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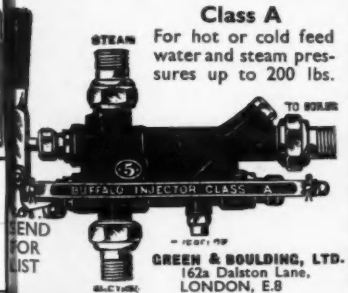
BUFFALO INJECTORS

Class A

For hot or cold feed water and steam pressures up to 200 lbs.



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...le to the public and in bulk for works use.

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WESTERN GAS BOARD

CHELTENHAM DIVISION

GAS fitters required to operate in the Forest of Dean District. J.I.C. Rates of Pay and Conditions of Service. Applications, stating age, experience, qualifications, accompanied by two references, to District Engineer and Manager, 1, Victoria Street, Cinderford, Glos.

SOUTH WESTERN GAS BOARD

BRISTOL/BATH DIVISION
DRAUGHTSMAN

APPLICATIONS are invited for the position of SENIOR DRAUGHTSMAN. Applicants should be experienced in Constructional work and experience in the Gas, Oil or Chemical Industry will be an advantage.

The salary offered will be within the range—£660/£800 p.a., placing within the range to be in accordance with experience and ab'lity.

The successful applicant will be required to contribute to the Board's Pension Scheme and to undergo a Medical Examination.

Applications should be received by the undersigned not later than Saturday, December 17, 1955.

CHARLES R. INGHAM,
Production Engineer & Manager.

Radiant House,
Bristol, 1.

December 2, 1955.

THOMAS GLOVER AND CO., LTD.

GAS METER MANUFACTURERS
BRANCH MANAGER—BELFAST

APPLICATIONS are invited for the above appoint-ment which covers the management of an establishment engaged upon the assembly and testing of gas meters and, at present, also the assembly of gas cookers.

Candidates should possess technical and managerial experience in the Gas Industry or in Light Engineering and similar industry. Some knowledge of sheet-metal work and the construction and maintenance of Gas Meters and Cookers, while by no means essential, would be advantageous.

The successful Candidate will be expected to reside in or near Belfast, and to exercise control over the Branch Factory, subject to the general direction of the Manager of the Company's principal Factory in London, with whom close contact must be maintained.

The commencing salary for the position will be at the rate of £700 per annum and the successful Candidate will be required to pass a medical examination and also to join the Company's Staff Superannuation Scheme.

Applications stating age, qualifications, experience, present appointment and salary, and accompanied by the names of two referees should be addressed to the Managing Director, Thomas Glover and Co., Ltd., 48, Grosvenor Gardens, London, S.W.1, to arrive not later than Friday, December 30, 1955.

R. & A. MAIN LIMITED invite applications from young graduates to fill the following positions:—

(a) Chemists or physicists for research and development work on domestic appliances.

(b) Chemical engineers or chemists to investigate and control manufacturing processes.

The positions offered are permanent and progressive and salaries commensurate with age and experience will be paid to successful candidates. Apply giving full details as to age, experience and qualifications to Personnel Manager, R. & A. Main Ltd., Gothic Works, Angel Road, Edmonton, N.18.

EAST MIDLANDS GAS BOARD

LINCOLNSHIRE DIVISION
TECHNICAL ASSISTANT (DISTRIBUTION)—GRIMSBY GROUP

APPLICATIONS are invited for the above appoint-ment which will be made within Grade APT. 5/6 of the National Salary Scales for Gas Staffs (£530/£645).

Applicants should hold at least the Ordinary Grade Certificate in Gas Engineering (Supply), and have a thorough knowledge of modern methods of distribution, including high and low pressure systems, and should be capable of carrying out the detail work in connection with the planning and estimating of new work.

The position is pensionable, and the successful applicant will be required to pass a medical examination.

Applications, stating age, and giving details of education, training and experience, together with the names of two referees, should be addressed to the Group Manager, East Midlands Gas Board, Sheepfold Street, Grimsby, to arrive not later than December 24, 1955.

BERNARD CLARKE,
Divisional General Manager.

November 29, 1955.

EAST MIDLANDS GAS BOARD

SHEFFIELD AND ROTHERHAM DIVISION
TECHNICAL ASSISTANT—GRIMESTHORPE GAS WORKS, SHEFFIELD

APPLICATIONS are invited from suitably qualified persons for the position of TECHNICAL ASSISTANT at Grimesthorpe Works.

Applicants should preferably hold the Higher National Certificate in Gas Engineering and have had experience of horizontal retort installations and carburetted water gas plants.

The salary for the position will be within Grade A.P.T. 7 of the National Salary Scales for Gas Staffs, ranging from £620 to £700 per annum, and the initial placing on the Scale will be in accordance with qualifications, experience and ability.

The position is pensionable and the successful applicant will be required to pass a medical examination.

Applications, giving details of age, education, training, qualifications and experience, together with the names and addresses of two referees, should be addressed to reach the undersigned not later than December 19, 1955.

C. C. WOOD,
Divisional General Manager.

Commercial Street,
Sheffield, 1.

November 24, 1955.

Classified advertisements continued on page 680

There are all sorts of photographs . . .

. . . ranging from furtive to fine art. Whatever sort you want, the answer is always in the negative, if you see what we mean. But if you want *positive* results in industrial photography you could not do better than contact **Walter King Photographs,** 11, Bolt Court, Fleet Street, E.C.4. (Tel. FLEet Street 2236)

WALTER KING WK PHOTOGRAPHS

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APPOINTMENTS VACANT (*ctd.*)

DEVELOPMENT Chemist required for Manchester Area. State qualifications, experience, age and salary required. Apply: No. 266, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

NORTH THAMES GAS BOARD

CHEMISTS and PHYSICISTS holding University degrees are required in the Laboratories at Watson House, Fulham, S.W.6, to undertake research work on the utilisation and design of domestic and industrial gas and coke appliances, particularly on cookers, water heaters, gas and coke fires, refrigerators and industrial apparatus.

The Laboratories have recently been modernized and extended and are responsible for research work for the Gas Industry throughout the country.

The appointments will be permanent and pensionable and the starting salary will be within the range of £635 to £850 per annum, according to age, qualifications and experience.

Applications should be sent to the Staff Controller, North Thames Gas Board, 30, Kensington Church Street, W.8, quoting reference No. 666/280, to reach him within ten days of the appearance of this advertisement.

SCOTTISH GAS BOARD

PERTH GROUP
TECHNICAL ASSISTANT (DISTRIBUTION)

APPLICATIONS are invited for the post of TECHNICAL ASSISTANT (DISTRIBUTION) at Perth. Experience in Sales, Installations and/or Mainlaying work would be an advantage. The Salary offered is Provincial A Grade A.P.T. 6 (£565/£645 per annum), with placing according to qualifications and experience. The post is pensionable and the person appointed will be required to pass a medical examination.

Applications, stating age, education, training, qualifications and experience, should reach the undersigned not later than December 21, 1955.

W. NICOL BAIRD,
Group Manager.

WEST MIDLANDS GAS BOARD

WALSALL AND DISTRICT DIVISION
DEPUTY DIVISIONAL ACCOUNTANT

APPLICATIONS are invited from qualified Accountants for the above position. Candidates should preferably have had extensive practical experience in the finance and accountancy of public utilities, including the preparation of Financial and Cost Accounts. The salary will be £1,000 × £50 — £1,200 per annum.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with the details of present and previous appointments and the names of two referees, should reach the Industrial Relations Officer, West Midlands Gas Board, 6, Augustus Road, Edgbaston, Birmingham, 15, not later than December 19, 1955.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION
SHIFT FOREMEN,
C.W.G. PLANT, NECHELLS GAS WORKS

THE duties include the control of large Carburetted Water Gas Plants, together with their ancillaries, under the supervision of the Assistant Engineer (C.W.G.) and his technical staff.

A knowledge of Carburetted Water Gas Plant is essential and the possession of City and Guilds Certificate in Gas Technology will be an advantage.

It is intended that, as opportunity permits, C.W.G. Foremen will be interchanged with Retort House Foremen.

The salary will be within Grade 7 (£620/£700 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, experience, positions held and qualifications, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Gas Offices, Edmund Street, Birmingham 3, to reach him not later than December 17, 1955.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION
SECOND ENGINEERING ASSISTANT,
NECHELLS GAS WORKS

THE duties will entail technical work and general assistance in the supervision of large Carburetted Water Gas Plants having a total capacity of 31 millions cubic feet per day, or in a large modern retort house, together with ancillary plant connected with Carburetted Water Gas and Coal Gas production.

Candidates should be Associate Members of the Institution of Gas Engineers or possess equivalent qualifications. Opportunity will be afforded to gain wide experience on gas production plant on a large gas works.

The salary will be within Grade 8 (£660/£740 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, experience, positions held and qualifications, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Gas Offices, Edmund Street, Birmingham 3, to reach him not later than December 17, 1955.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION
DRAUGHTSMAN,
DIVISIONAL ENGINEER'S OFFICE,
SALTLEY, BIRMINGHAM

CANDIDATES should hold a Higher National Certificate in Civil or Mechanical Engineering or equivalent qualification, and have had considerable experience in an Engineering Drawing Office, including plant layout; a knowledge of Gas Works Plant will be an advantage but is not essential.

The salary will be within Grade 9 (£700-£800 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, experience and qualifications, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Birmingham and District Division, Gas Offices, Edmund Street, Birmingham 3, to reach him not later than December 21, 1955.

J. C. INGRAM,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION
FIRST ENGINEERING ASSISTANT
NECHELLS GAS WORKS

THE duties will entail supervision and te control of Water Gas Production in plants h a total capacity of 31 millions cubic feet per d of Coal Gas Production in a large modern house and day to day control of ancillar plan nected with Carburetted Water Gas an Co Production, with direct responsibility to the As Engineer.

Candidates should be Associate Mem ers Institution of Gas Engineers or posses equ qualifications. The holding of a Diploma i Engineering (Manufacture) will be an adva Opportunity will be afforded to gain wid expe on gas production plant on a large gas works.

The salary will be within Grade 11 (£735/£9 annum) of the National Salary Scales for Gas

The post is pensionable, and the successful date may be required to pass a medical exami

Applications stating age, experience, position and qualifications, together with the names referees, should be addressed to Mr. J. E. Wa Divisional General Manager, West Midland Board, Gas Offices, Edmund Street, Birmingh to reach him not later than December 17,

J. C. INGRAM,
Secretary to the Boa

DOMESTIC UTILISATION OF GAS

SMITH & LE FEVRE

20/- *inc. postage*

WALTER KING, LTD.

11, Bolt Court, Fleet Street,

E.C.4.

PLANT FOR SALE

FOR SALE: NEW GAS-FIRED BOILE Hartley & Sugden. 160 lbs./hour at 80 lbs complete with chimney, spare burner and o Original purchase price was £419. Our pric W. H. COLLINGBOURNE & CO., LTD. Stratford Road, Birmingham, 28. Phone: 3303.

The **LIMIT OF EFFICIENCY CAN BE REACHED** *by the use of*

LUX

GAS PURIFYING MATERIA

Sole Importers:

HARRISONS (London) LIM TE 66, Mark Lane, LONDON, E.

Telegrams: Birchrock, London *Telephone:* ROYal 212

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TOWER PURIFIERS

FOUNDED 1850 HOLMES HUDDERSFIELD

W. C. HOLMES & CO. LTD · TURNBRIDGE · HUDDERSFIELD

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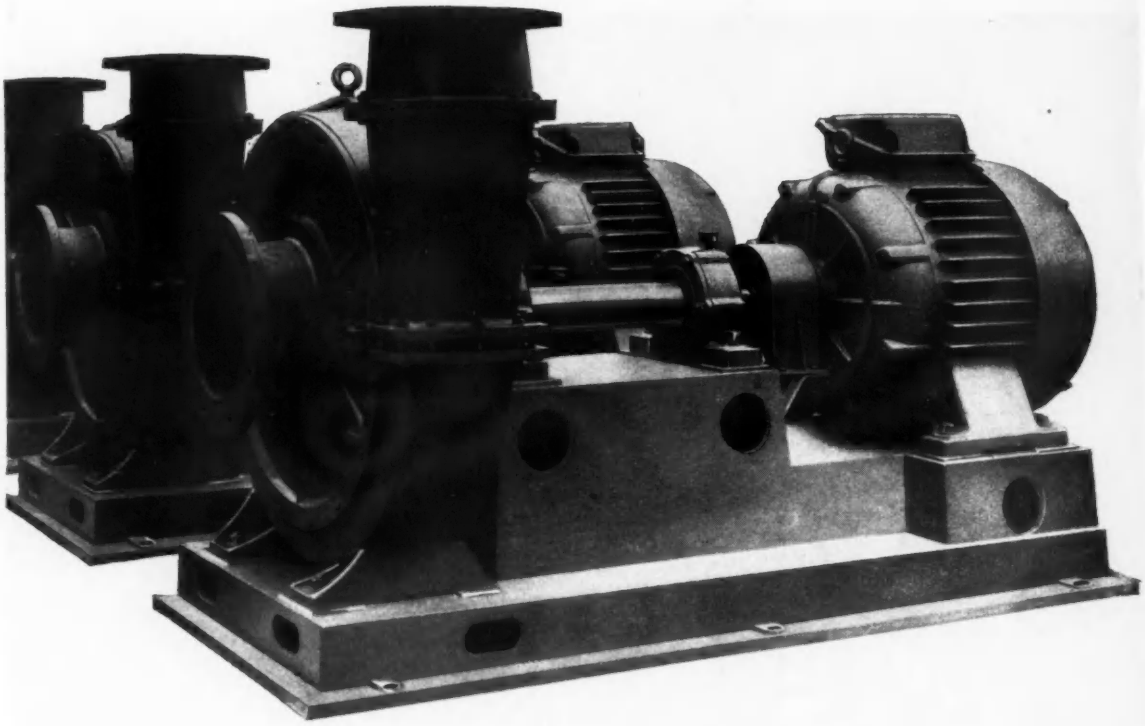
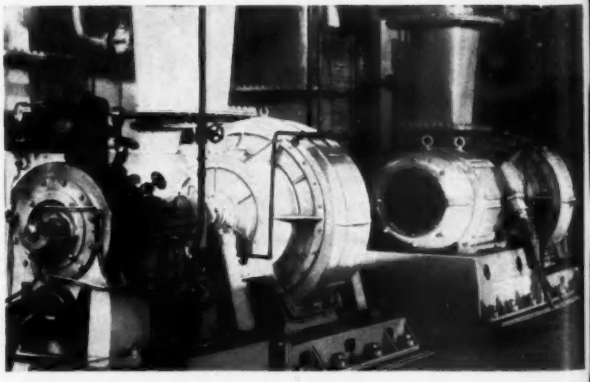


Gas Boosters?

Photo by courtesy of the S. E. Gas Board and Humphreys & Glasgow Ltd.



EXAMPLES of gas boosting fans with cast iron casings are illustrated here. They represent the results of special attention to the design and development of robust, trouble-free boosters over the years. This experience provides fans for handling volumes of 5,000 to 1½ million cubic feet of gas per hour at pressures up to several pounds per square inch.
When the time comes you'll find there's no easier way to solve your air or gas moving problem than to put it to Keith Blackman.

contact **Keith Blackman Ltd**

MILL MEAD ROAD · LONDON · N17 · TOTtenham 4522

T.A.722

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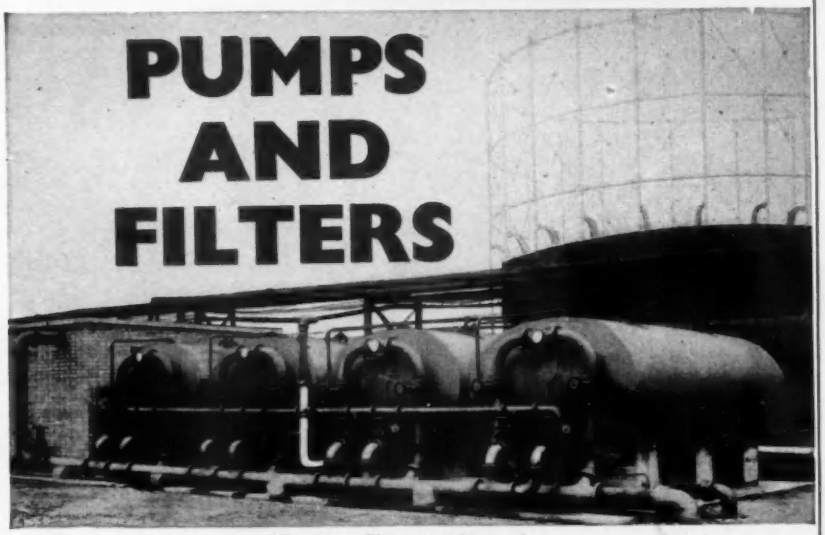
CLEAN AIR
GLOVER-WEST
CONTINUOUS VERTICAL RETORTS
The Sydney installations of Glover-West retorts have a nominal daily capacity of 32,000,000 cu. ft of gas
Sydney Harbour Bridge
WEST'S GAS IMPROVEMENT CO. LTD MILES PLATTING · MANCHESTER 10.
London: Columbia House, Aldwych, W.C.2 C.O.L. Div: Chandos House, Buckingham Gate, S.W.1

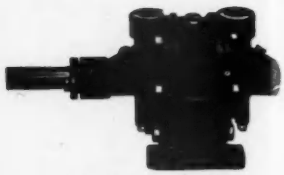
Pulsometer Engineering Co. Ltd.
NINE ELMS IRONWORKS · CULWELL WORKS
READING · WOLVERHAMPTON

PUMPS AND FILTERS

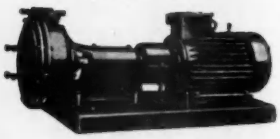


Filtration Plant in Gasworks

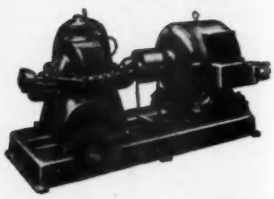
The illustrations show centrifugal pumps for light and heavy oil and liquor duties, stoneware and special metal pumps for handling acids and alkalis, pumps for circulating and washer duties, for clean water and fire services and for liquids containing abrasives.



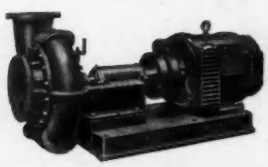
Rotary pump for Oil transfer duties



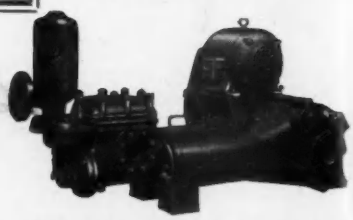
Stoneware pump for Corrosive and chemicals



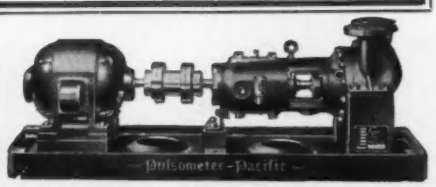
"HS" Type—for water services. All heads up to 500 feet.



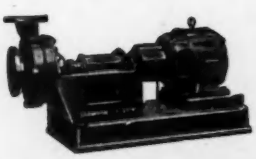
Slurry pump for coal washing and abrasive liquids.



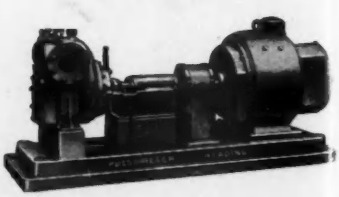
Reciprocating pump of modern design for Gas Works.



Pulsometer—Pacific type, based on latest American practice.



"JA" & "JB" types for high temperature water circulation.



Self priming centrifugal pumps.

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